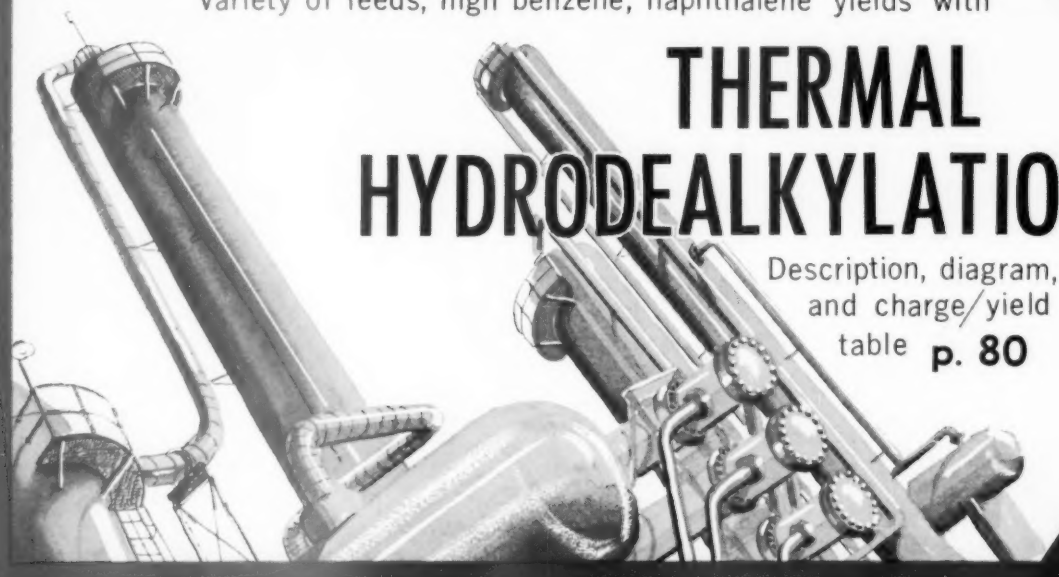
the OIL AND GAS JOURNAL
PUBLISHED WEEKLY MARCH 6, 1961

Variety of feeds, high benzene, naphthalene yields with

THERMAL HYDRODEALKYLATION

Description, diagram, and charge/yield table p. 80

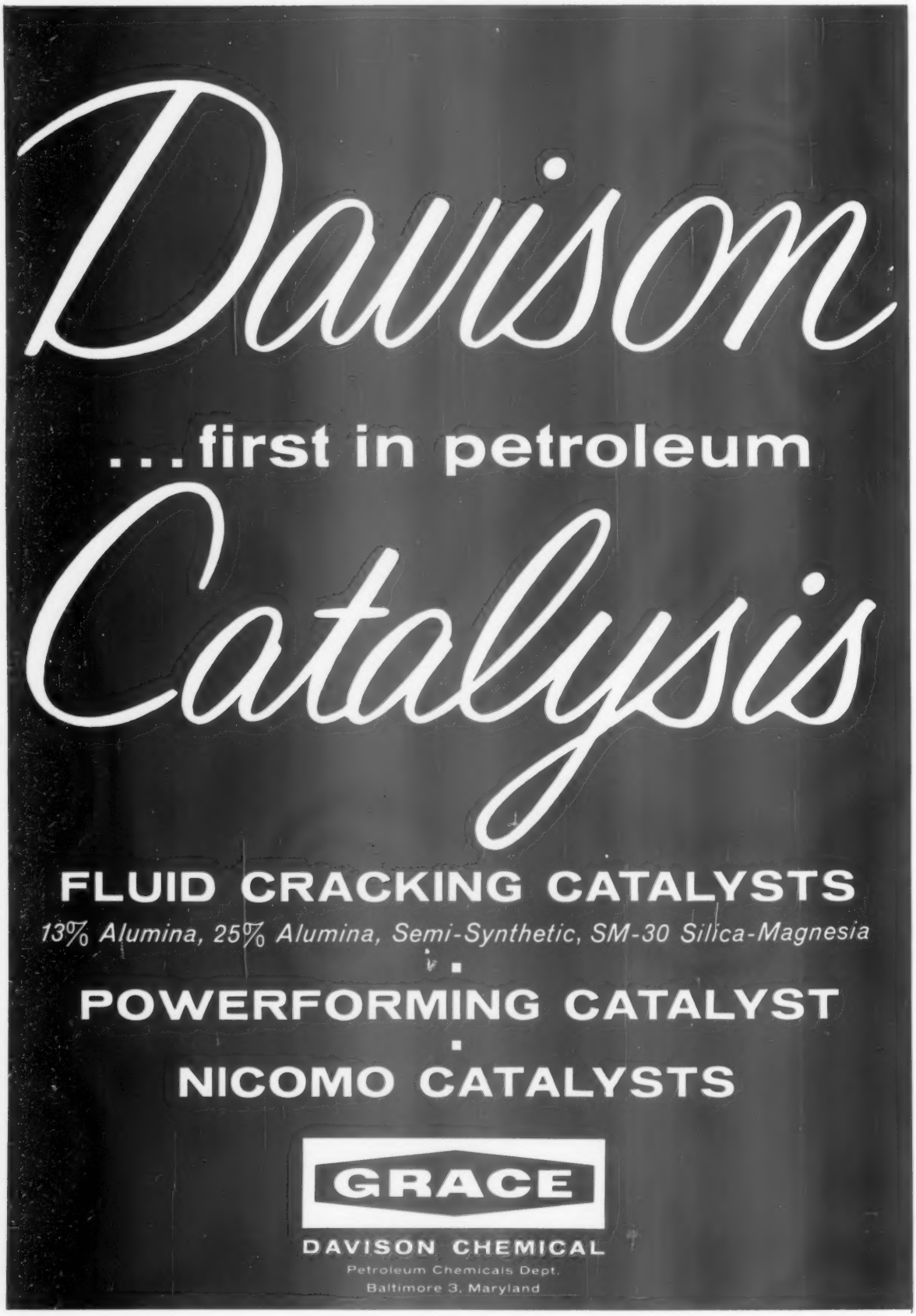


Washington moves more deeply into oil ▸ 77

Phillips plunges into eastern markets ▸ 82

East Texas gets best find in 8 years ▸ 84

How California operators drill slant holes ▸ 109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OIL AND GAS JOURNAL
Vol. 59, No. 10

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TECHNOLOGY–OPERATION

Drilling-Production

Tips on How to Drill a Slant Hole **109**

By Carl Lawrence

Some of the ground rules on what to expect in directional drilling, a must in developing a big percentage of California's oil reserves, have evolved from town-lot drilling done by Signal Oil & Gas Co. in Cheviot Hills field in West Los Angeles.

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By Joseph Zaba

The how and why of torque factors.

New Method for Quick Determination of Formation Brines **126**

By R George Mihram and K. A. Catto, Jr.

Locating the source of produced salt water can now be done quickly and easily with a new method using flame spectrophotometry. Minimum amount of sample is needed, and method is free from analysis and calculation errors.

Geothermal Gradient Maps Planned **138**

Refining-Processing

The Future of Chlorinated Hydrocarbons **112**

By R. K. Treichler

Annual production of chlorinated hydrocarbons was about 3.25 million pounds in 1960. Based on new uses and new products, this is expected to increase to 4.5 million pounds by 1970.

WPRA Panel Answers Alkylation Problems **116**

A panel of experts hand-picked from the U. S. refining industry answered many questions concerning alkylation operations during a recent WPRA meeting in El Dorado, Ark. Here are their answers to the most significant questions.

Refinery Construction and Operation Cost Indexes **124**

How to Make Gasoline with Less Olefins **130**

By Merrill J. Fowle, John A. Nevison, C. Davis Wrigley, and Martin Brill

As the pressure for smog control grows, refiners may well be forced to limit the amount of olefins in gasoline. Los Angeles refiners are currently faced with such a regulation. It may spread. Faced with this prospect, Atlantic studied the effects such a move would have on processing and its cost.

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ABC's of heat-transfer principles.

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The cost of higher product quality and improved refinery efficiency.

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Novel Cooling Hikes Efficiency of Compressor Station **147**

By W. M. Kauffmann

General

Economics of a Sound Safety Program—5 ..... **122**

Build accident prevention into a safety program.

By James H. Herbert

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
March 6, 1961

The natural-gas processing industry is booming:

Preliminary returns on The Journal's upcoming survey of U. S. and Canadian facilities are showing a healthy growth trend.

The outlook:

...In the U. S.—gas-processing capacity will jump 22% during the 1960-61 period with liquid production rising 16%. Brightest spot is Louisiana with prospects of a 70% jump in capacity.

...In Canada—activity is growing even faster. Gas throughput capacity rose 37% last year, will jump another 49% this year, thus doubling capacity in the 2 years. Natural-gas liquid output is rising 177% over the 2-year period.

Demand is brisk for natural-gas liquids in the U. S. but production in Canada is stifled by lack of ready outlets. That explains the great pressure for gaining markets in the Chicago area.

▼ ▼ ▼

Major field may be shaping up in James lime reef play near town of Frankston in East Texas.

New producing area already has 10 good wells and eight wells are drilling with locations staked for five more.

The reef development resembles that of some of the prolific Pennsylvanian reefs of West Central Texas (p. 84)*.

An all-time mark for a single Michigan producing area was set by crude runs from Scipio-Albion trend in January.

Production totaled 1,004,327 bbl., the first time any Michigan field topped a million barrels in a single month. Porter field in Midland County peaked in March 1935 with 801,540 bbl., the previous record.

The Scipio-Albion trend now has 351 producing wells, brought in since the discovery well late in 1956. Heavy development occurred in 1959 and drilling has now subsided to 12 active rigs.

▼ ▼ ▼

Utah's Anido Creek field has an important southeast offset.

Sinclair 1 Navajo 5, San Juan County, flowed 1,032 bbl. daily through ¾-in. choke from Ismay Pennsylvanian perforations at

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*Refers to article in this issue giving more details. When no page is given, the item is a Newsletter exclusive.

5,308-23 ft. Score in field is three producers, one dry hole since the 2,000-bbl. daily discovery well was completed.

First dual producer in Sleepy Hollow field, Red Willow County, Nebraska, has been completed in Cambrian and Pennsylvanian zones by Pubco Petroleum. Its 10-3 well pumped 125 bbl. daily from Lansing-Kansas City at 3,276-82 ft. and 200 bbl. daily from Reagan at 3,498-3,501 ft.

Spirited lease play is spreading across northern Jasper and Newton counties in southeastern Texas and is lapping across the state line into Vernon Parish, Louisiana.

The play follows a path about 10 miles wide along an indicated reef trend. Pan American reportedly is one of the biggest buyers.

Humble is not giving up yet in Georgia.

Despite two recent failures to tap oil or gas in the so-far barren state, Humble is starting another wildcat, the 1 Helemn in Brantly County, in southeastern corner of the state.

Failures were in Wayne County also in southeast and Seminole County in the southwest.

▼ ▼ ▼

Domestic drilling contractors were paid 40 cents less per foot of hole drilled last year than 3 years ago, AAODC survey shows. And the rotary-drilled wells averaged 293-ft. deeper.

Average well last year was 6,124-ft. deep for which contractor got average of $4.11 per foot, exclusive of day-work charges.

Contractors received 22 cents more in 1959, 16 cents more in 1958, and 40 cents more in 1957 than in 1960.

Chink in legal armor of tiny-tract drillers may have been opened by decision of the Texas Supreme Court (p. 90).

Court holds that the laws of trespass can be used to prevent fracturing of well when the fractures would cross lease lines.

Critics of Oklahoma's proposed new field rules had their say last week—the advocates come to bat this week.

The new rules (OGJ, Jan. 23, p. 48) aim to make operators more responsible, tighten up administration to eliminate illegitimate water floods and prevent pollution, and to institute new allowable formula to encourage deep drilling and wider spacing.

Opposition, mainly from smaller operators, centered on these areas:

...Administration—bonding requirements are too high and the antipollution provisions too expensive on operators.

...Allowables—depth-acreage factor favors major companies. Independents suggested a 20-bbl. daily minimum, greater discovery allowables, and limits on gas-condensate production.

Other suggestions: Creation of four conservation districts to administer the rules and creation of an office of public representative to challenge all filings before the commission.

Hearings are being held before the oil and gas committee of the Oklahoma Senate. The corporation commission expects to put the new rules into effect later this month.

▼ ▼ ▼

New thermal method for dealkylating with hydrogen has been announced by Atlantic Refining and Hydrocarbon Research.

The thermal method gives high yields of benzene from toluene, axylenes, and other feedstocks. It can produce naphthalene using catalytic cracking cycle stocks and other refinery streams.

Big impetus behind the development is growing markets for benzene and naphthalene (p. 80).

Starting pay for graduating chemists and chemical engineers rose 8% in 1960, ACS study reveals. Increase was largest in years.

For chemists, average monthly wage: Bachelor's degree $475, master's $550, doctorate $750.

For chemical engineers: Bachelor's $520, master's $585, and doctorate $775.

▼ ▼ ▼

Challenge has been made by David Wood, public relations chief of Pembina Pipeline, Inc., on published data purporting to show that Interprovincial Pipe Line would have a tariff advantage on rival proposals for an Alberta-Chicago natural-gas liquids line.

He claims the advantage is with Pembina-Indiana Standard line. The comparative rates for 50,000 bbl. daily minimum load are 44 cents for Interprovincial's Edmonton-to-Chicago haul and 40 cents on Pembina's Calgary-to-Chicago route. Furthermore, Wood says Pembina has guaranteed a 25-year weighted average of 37 cents per barrel for main-line tariff.

None of the figures cover gathering charges and all concern movement of natural-gas liquids.

Canadian test using natural gas in blast furnaces is being watched by both the gas and steel industries.

Steel Co. of Canada will begin the test next month. Aim is to determine if natural gas in blast furnaces will increase iron yields and reduce coke consumption. Results of similar tests with gas and fuel oil looked promising.

▼ ▼ ▼

Industry notes: Texaco reportedly plans to open an exploration office in Olympia, Wash., after a 4-year absence from the Pacific Northwest...American Oil will lay off 450 workers before end of year at its Whiting refinery due to modernization program boosting more automatic equipment...Indiana Oil Purchasing's new price bulletins chiefly added a few new areas to the postings or deleted a few—prices basically remained the same. Two notable cuts were 21 cents per barrel on East and West Hackberry in Louisiana and 13 cents on Antelope (Duperow) in North Dakota.

Market Memo

March 6, 1961

Markets are squarely in the middle of the in-between season, and the softer look of prices is reflecting it.

Weakness for both distillates and gasoline has eroded prices in the Chicago and Mid-Continent areas. Other regions are paying lip service only to postings.

Chicago currently is in the worst trouble.

No. 1 and No. 2, even at one-fourth cent lower postings of 10.75 and 10 cents respectively, are being discounted. It's one-half off on No. 2 and three-fourths on No. 1. Some sellers even are ignoring the differences in the two products and are lumping No. 1 and No. 2 into a single product.

Gasoline, posted at 12.375 cents for 92-octane, is being discounted by one-half to three-fourths of a cent and not too hard to find at the bargain prices.

The Chicago spirit is inching down the Great Lakes Pipe Line.

Most spot gasoline is moving at 11.75 cents, a three-fourths of a cent discount from the 12.5-cent posting. There's no call for distillates which still are being discounted one-fourth from their lower postings of 10.25 for No. 1 and 9.25 for No. 2.

There's very little activity on the Mississippi River, on the Gulf, or along the East Coast.

Rumors persist that a cargo of gasoline was sold on the Gulf at one-half cent off the Gulf low and that another slug was sought for upriver movement at a cent off. Neither can be pinned down.

No. 2 on the Gulf holds at its 9.5-cent posting but some majors who bought last month for March delivery have indicated they would gladly let others take their commitments.

The general outlook: More of the same for the next few weeks. The heating season is closing out unless March brings unusually cold storms. The gasoline season is still a few weeks away. One trend to watch: The price differential in No. 1 and No. 2 may be changed by next year. Marketers are talking about a three-fourths to one-half-cent spread instead of the present one-cent.

Around the marketing beat: Sinclair is really pushing to upgrade its operations, has divested itself of large volume of unprofitable business and disposed of hundreds of poor outlets...Ejay Chemical, citing rising costs, will jump price of its petroleum additives by 5% April 1. Included are complete line of oil additives as well as gasoline improvers and industrial oil additives...API Travel Development Committee has asked J. Walter Thompson agency to work up a travel-promotion campaign...Humble is using its own "Happy Stamps" at its two new service stations in Ohio.

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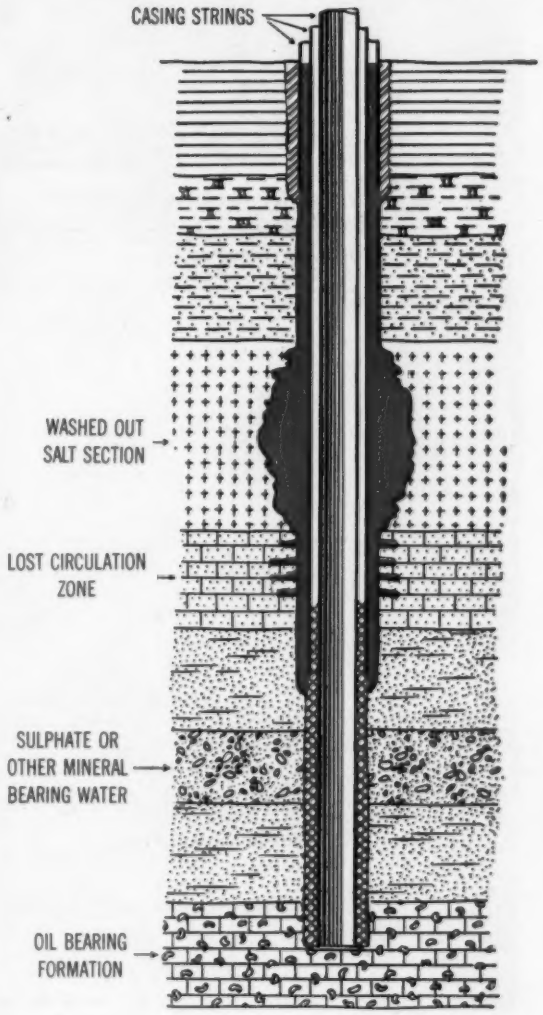

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The swab test through a LYNES Tool is more positive than a D.S.T., but the potential of the LYNES Test does not stop there. Stimulation treatment is a normal progression of this test—then further Swab Testing.

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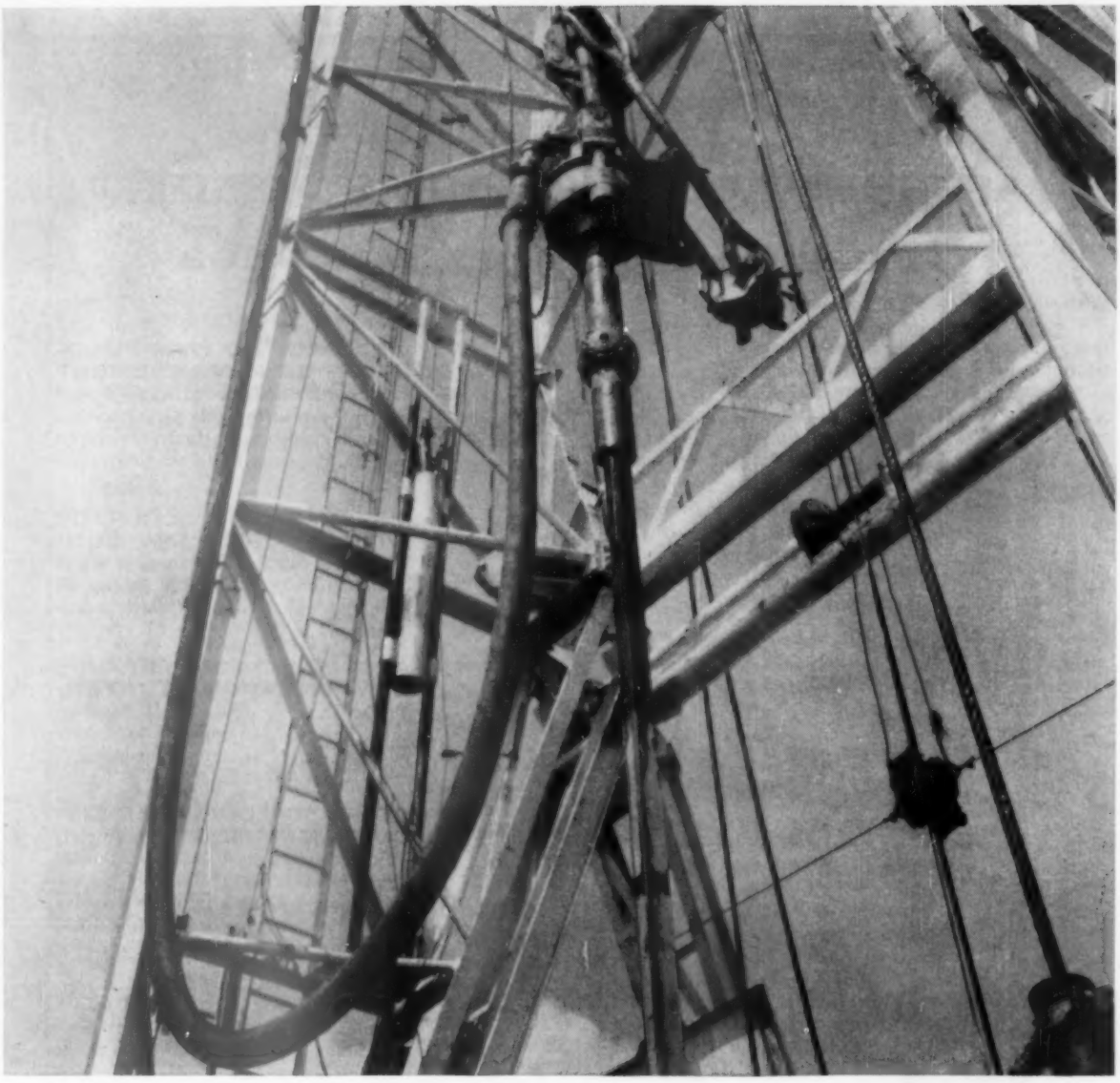

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B.F.Goodrich Highflex hose is in stock at leading supply stores in the oil field, or at any of these B.F.Goodrich warehouses: Los Angeles, Great Bend, New Orleans, Shreveport, Hobbs, Oklahoma City, Tulsa, Corpus Christi, Dallas, Houston, Kilgore, Odessa, Wichita Falls. *B.F.Goodrich Industrial Products Company, M-967, Akron 18, O.*

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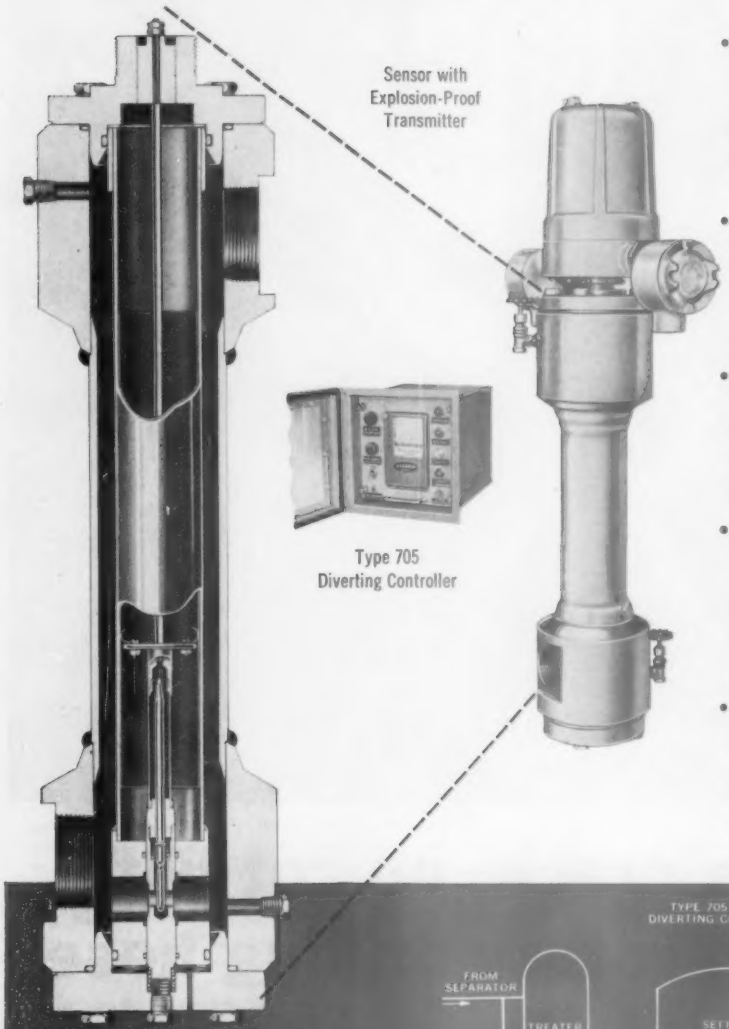

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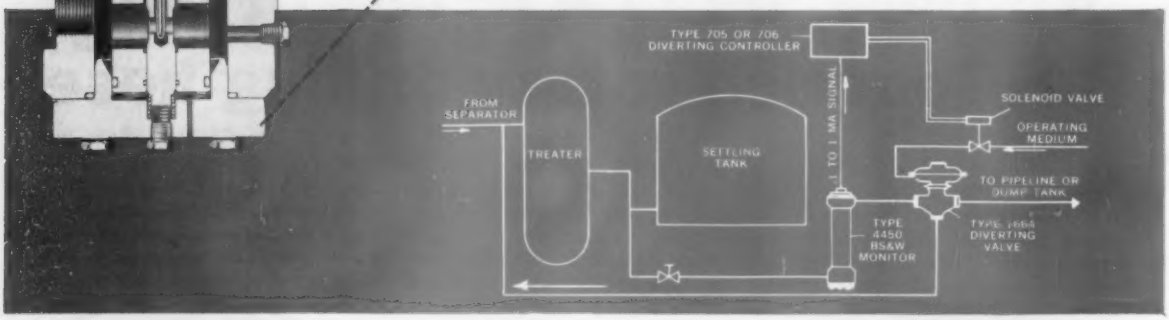

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Problem Approach Guide

FOAMING OF ETHANOLAMINE SOLUTIONS

For a quick diagnosis of foaming problems encountered in ethanolamine solutions used for gas treating, the major causes of foaming and their remedial treatments are discussed.

CAUSES OF FOAMING

Foaming of ethanolamine solutions can usually be attributed to contamination by one of the following:

1. Suspended solids.
2. Liquid hydrocarbons.
3. Organic acids in inlet gas which react with ethanolamine to form soap-like materials.
4. Surface-active agents contained in oil field inhibitors, compressor oils, pump and valve lubricants, etc.
5. Ethanolamine decomposition and degradation products.

EFFECT OF FOAMING

Reduction in treating capacity and loss of ethanolamine are the two major problems associated with foaming. Foaming has a direct effect on capacity due to loss of proper vapor-liquid contact, solution hold-up and poor solution distribution. Entrainment and carry-over of amine in the treated gas is not uncommon during foaming.

TEMPORARY FOAM CONTROL

When foaming occurs, it is usually important that an antifoam agent be selected to reduce the foaming tendency of the amine solution until a more permanent remedy can be found. Antifoam agents that work in one plant will not necessarily work in another so it is often necessary to evaluate a number of compounds. Evaluation of various antifoam agents should be done in the laboratory prior to plant use. There are a number of good silicone type antifoam agents that handle a wide variety of foaming conditions. The high molecular weight alcohols and low foaming surface-active agents, such as SURFONIC® N-10, have been used effectively.

REMOVAL OF CONTAMINANTS CAUSING FOAMING

Removal of suspended solids and sludge can best be accomplished by continuous filtration of a sidestream of the circulating amine solution. In heavily contaminated streams, up to 25 per cent of the solution circulated is continuously filtered. As the amount of solids and sludge is brought down to normal operating levels, the amount filtered can usually be reduced to a range of 5 to 10 per cent with good results.

There are numerous types of filters available that are capable of performing a satisfactory job. The most popular type filters are those using either a precoat or disposable filter cartridges. When precoat filters are used in systems having a normal heavy load of insoluble matter, continuous injection of the precoat slurry into the amine feed to the filter can be used to extend filter cycle time.

If foaming is found to be caused by the presence of liquid hydrocarbons, it is probable that contamination is due to either entrainment of liquid hydrocarbons through the inlet separator or condensation of hydrocarbons from the gas phase in the contactor. When the problem is due to entrainment, operation and efficiency of the inlet scrubber should be checked. Condensation of hydrocarbons in the contactor can usually be eliminated by adjusting the temperature of the lean amine solution to the contactor to a level of 10 to 15°F. above the inlet gas temperature.

Presence of organic acids in the inlet gas is fairly well restricted to refinery operations. Some organic acids such as napthenic acid will react with the ethanolamines to produce soap-like compounds which may cause foaming. In these cases, it may be necessary to provide a gas scrubbing or washing operation prior to amine treating.

Some of the most troublesome cases of foaming are caused by minute quantities of surface-active agents of unidentifiable origin. One of the best means of removing these compounds from the ethanolamine solution is treatment with activated carbon. This is usually done by continuous filtration of a portion of the circulating solution through two beds of granular activated carbon arranged in series but piped so that they can be interchanged. Treatment or filtration of 2 to 5 per cent of the circulating solution is usually sufficient. These activated carbon filters are usually sized for a flow rate of 2 to 4 gallons per minute per square foot of cross sectional area. Recommended bed depths are 8 to 12 feet.

Many plants using monoethanolamine are using a semi-continuous batch distillation of a portion of the circulating solution. The amount processed will generally run from 1 to 2 per cent of the amine circulated. This type reclaiming procedure has been widely used to remove decomposition and degradation products from monoethanolamine solutions.

For complete information on Jefferson glycols, ethanolamines, and helpful technical services . . . contact Jefferson Chemical Company, Inc., 1121 Walker Avenue, P. O. Box 303, Houston 1, Texas.

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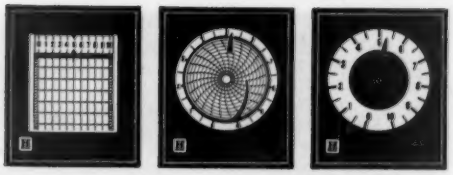

will save you more time, trouble, dollars, and maintenance than any other potentiometer on the market today!

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First in Control

SINCE 1885

MODULAR CONSTRUCTION, PLUG-IN COMPONENTS

make ElectroniK 17 easiest of all potentiometers to operate, convert, maintain.

INTERCHANGEABLE DISPLAY MODULE. You can switch easily from strip to circular chart, to circular scale operation . . . reduce your spare parts inventory because you can stock a single spare module for several instruments.

FRONT ADJUSTMENTS. You adjust damping and gain from the front of the instrument, using only a screwdriver.

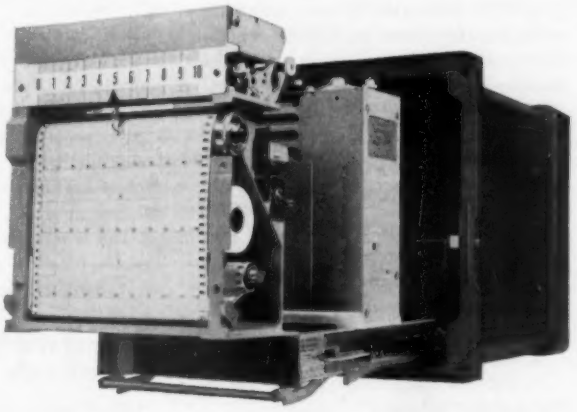
QUICK-CHANGE DRIVE GEARS. You can change chart speed to ½ or 2 times basic speed in a matter of seconds by replacing quick-change drive gears. Standard chart speeds: 1, 2, 6, 10, or 60 inches per hour.

EASY RANGE AND ACTUATION CHANGE. Simply change range card attached to actuation board. Universal reference junction compensator serves *all* types of thermocouples; you can quickly remove it to convert to some actuation other than thermocouple. Filter network rejects loop stray signals.

PULL-OUT CHASSIS AND EXTERNAL TERMINAL BOARD. You can pull out the chassis to the service position without tools and without interrupting the operation of the instrument, or completely remove it.

COMPACT EASILY-REMOVED TRANSISTOR AMPLIFIER. With only a screwdriver you can remove the amplifier for servicing.

NO STANDARDIZATION. Zener diode constant current unit does away with need for battery and standardizing mechanisms.



**Trademark*—Minneapolis-Honeywell Reg. Co.

HONEYWELL INTERNATIONAL Sales and Service offices in all principal cities of the world. Manufacturing in United States, United Kingdom, Canada, Netherlands, Germany, France, Japan.

Engineering Progress Report

FROM UNION CARBIDE CHEMICALS COMPANY

Glycol Dehydrators give 90°F. Dew Point Depressions...

Improved regeneration systems give high glycol concentrations

There are two methods commonly used today to dehydrate natural gas: one employs glycols; the other, dry desiccants. Most authorities agree that glycol systems are less expensive in both initial and operating costs. Recent engineering advances now permit dew point depressions up to 90°F. with economical glycol-type dehydrators. Union Carbide Chemicals Company maintains an extensive engineering service group designed to help the natural gas industry obtain the best possible dehydration service with CARBIDE's diethylene glycol and triethylene glycol.

A GRADUAL IMPROVEMENT

Diethylene glycol was first used to dehydrate natural gas in 1936 and by 1939 sixteen glycol type plants were in service providing average dew point depressions in the range of 40°F. Triethylene glycol was first used to dehydrate natural gas in 1949. The dew point depressions realized with glycol type plants have gradually increased until today the standard guarantee is a 65°F. depression or gas containing seven pounds of water per MMSCF, whichever first occurs. For sometime now, some equipment manufacturers have offered a 75°F. dew point depression guarantee.

FACTORS INFLUENCING DEW POINT DEPRESSION

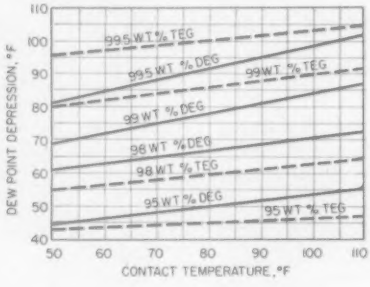
The dew-point depression obtained with a glycol dehydration plant depends upon several factors, such as:

1. Concentration of water in the lean glycol solution.
2. Glycol circulation rate.
3. Contact temperature in the top of the absorber column.
4. Efficiency of gas to glycol contact in the absorber.

Even with conservative design and operation, however, the dew point of the gas leaving the glycol contactor cannot be lower than the equilibrium value for the conditions of temperature and glycol concentration found on the top plate.

HIGH GLYCOL CONCENTRATIONS

The high diethylene and triethylene glycol concentrations now being obtained in plant practice, prompted studies to determine the dew point depressions obtainable with such solutions.



These data indicate that both diethylene and triethylene glycol at 99.5 per cent concentrations provide dew-point depressions in the 80°-105°F. range.

At concentrations of 98 per cent and lower, diethylene glycol provides better depressions than equal concentrations of triethylene glycol, while at 99 and 99.5 per cent concentrations, triethylene glycol appears to allow a 5°-10°F. lower dew point than diethylene glycol.

90°F. DEPRESSION MEETS TRANSMISSION REQUIREMENTS

Glycol regeneration equipment on the market today is capable of producing and maintaining glycol concentrations above 99%. Thus, it is possible for equipment manufacturers to guarantee a 90°F. minimum dew point depression. There are very few instances where a 90°F. depression will not meet the water content specifications of any long distance gas transmission company.

CARBIDE'S RESEARCH PROGRAM

Dew point depression studies are but one phase of CARBIDE's extensive research activities designed to improve the products and processes of the natural gas treating industry. CARBIDE's Technical Service Department stands ready to help you obtain the best possible results from your gas treating installations. For more information on the use of CARBIDE's glycols for gas dehydration, call the nearest CARBIDE technical representative or write, Union Carbide Chemicals Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y.

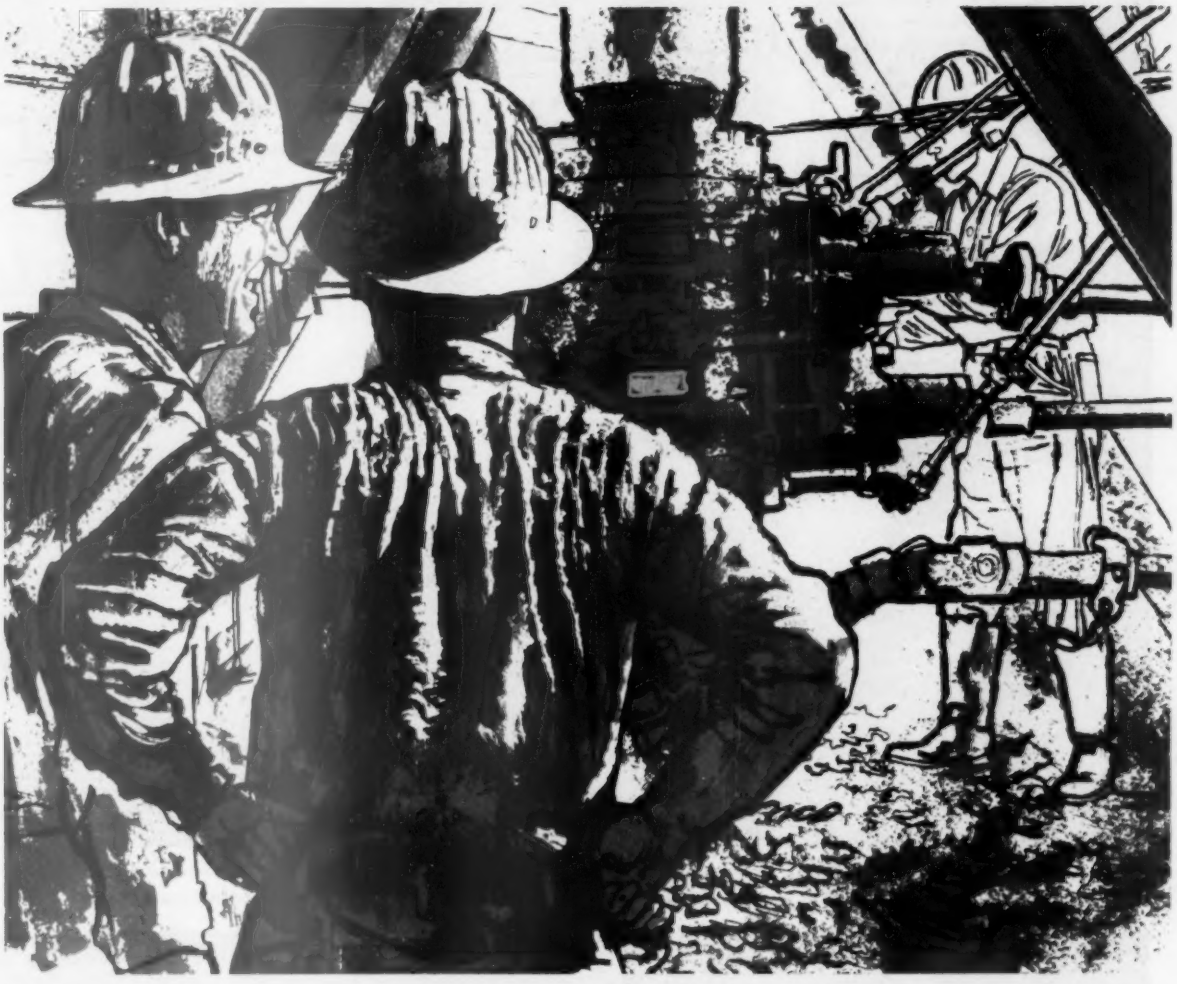
UNION CARBIDE is a registered trade mark of Union Carbide Corporation.

UNION CARBIDE CHEMICALS COMPANY

UNION CARBIDE

PROTECTION IN DEPTH

How it helps cut compensation costs



How well are your men equipped to handle a blowout?

A well that kicks can be the forerunner to disaster. How swiftly and effectively your crew on tour reacts largely determines the outcome. Are these men trained for a blowout emergency? Liberty Mutual loss prevention engineers help the pusher and drillers in their training program. They check blowout preventers, fire protection equipment and review the emergency procedures.

This thorough check-out is but one of the many Liberty Mutual services that add up to protection in depth. Liberty also helps drillers set up employee health programs, and maintains a loss prevention research center to find solutions to a wide variety of accident problems. When accidents do happen, specialized medical services are available — two rehabilitation centers, a special paraplegic ward, and diagnostic aid from leading orthopedic specialists all across the country.

Last year, protection in depth helped save Liberty Mutual compensation policyholders many millions of dollars. To find out how Liberty's protection in depth can help you save, too, just call the nearest Liberty Mutual office.

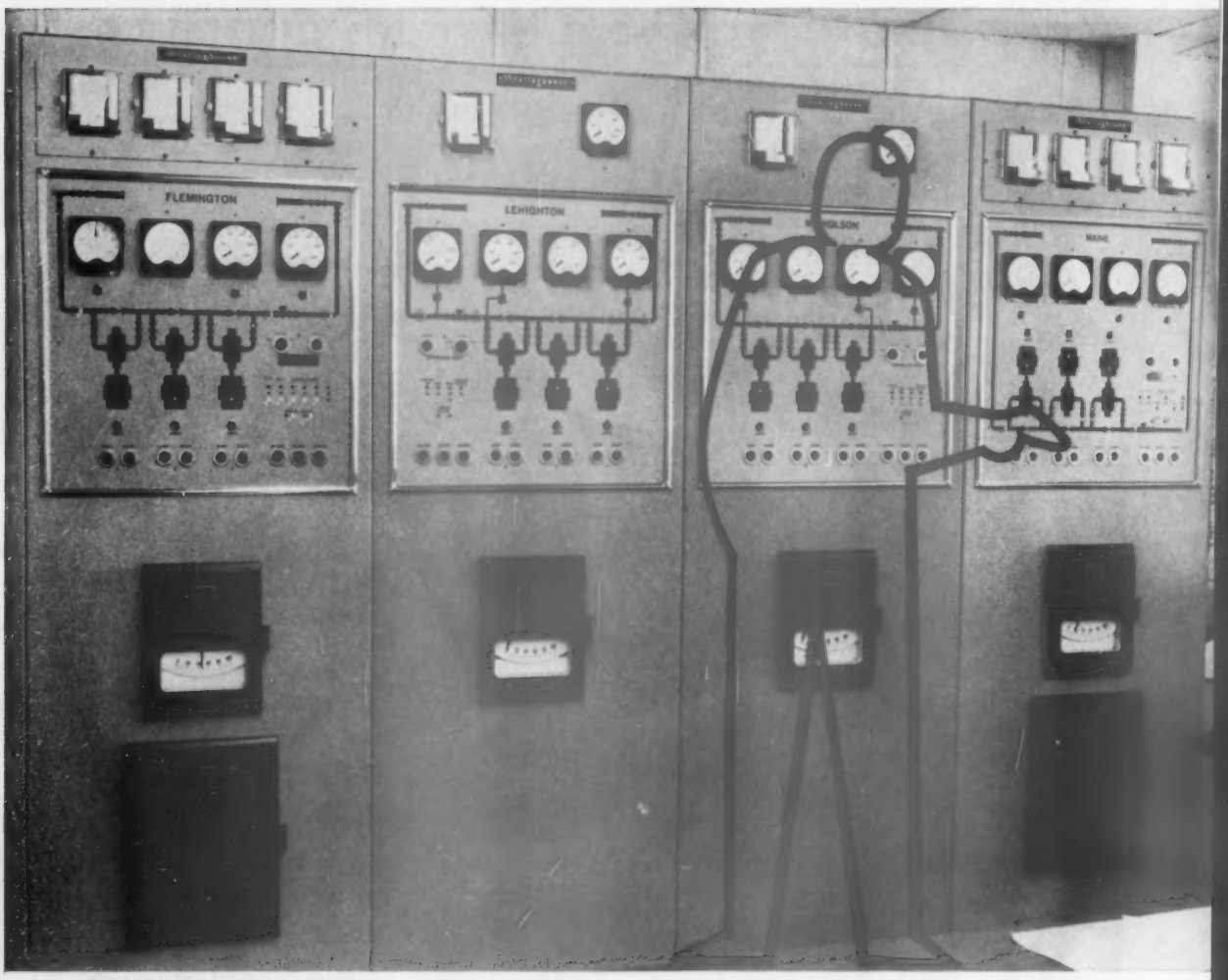
Look for more from

LIBERTY MUTUAL

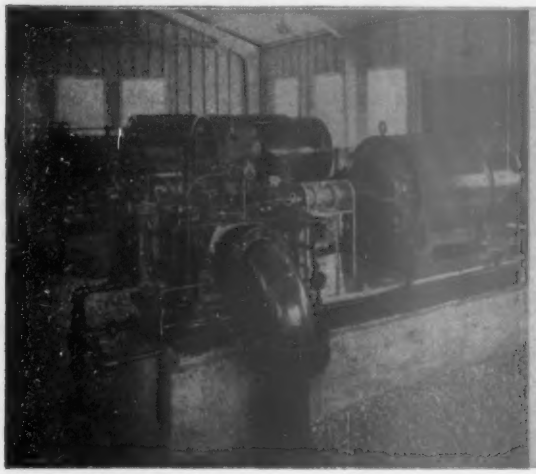
the company that stands by you

LIBERTY MUTUAL INSURANCE COMPANY • LIBERTY MUTUAL FIRE INSURANCE COMPANY • HOME OFFICE: BOSTON

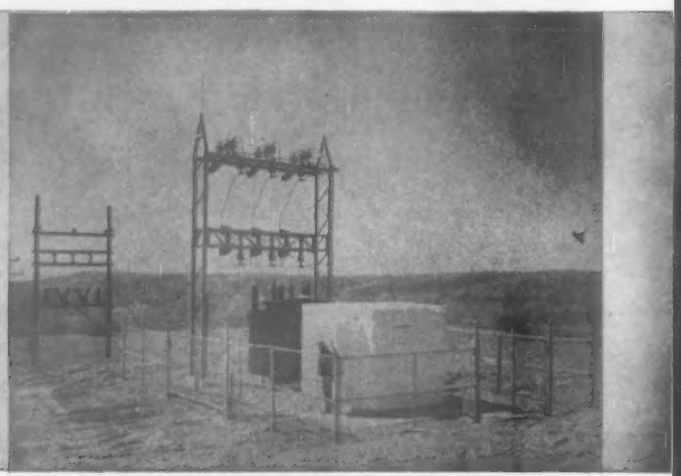
Personal Insurance: Automobile, Fire, Inland Marine, Burglary, Homeowners • **Business Insurance:** Workmen's Compensation, Liability, Group Accident and Health, Fire, Inland Marine, Fleet, Crime



CONSTANT SURVEILLANCE of operations at Buckeye's automated booster station is maintained by a Westinghouse control system. Indicator lights alert the dispatcher in Macungie, Pa., of any equipment trouble.



"NO MAJOR REPAIRS in 10 years." That's Buckeye's forecast for the huge, explosion-proof Westinghouse pump motors at the heart of Buckeye Pipe Line's new, remotely controlled booster station. Electrically powered stations like this Westinghouse-equipped installation at Maine, N.Y., are in sharp contrast to older, steam-operated stations needing 14 men around the clock.



"BEST POSSIBLE DESIGN" is Buckeye's opinion of 2000-kva Westinghouse transformer which steps incoming 34,400-volt power down to 2300 volts. Highly efficient operation was achieved after computer evaluated all possible design variables. Transformer's Insuldur® insulation system permits overloads with no reduction in service life.

WESTINGHOUSE AUTOMATES BUCKEYE PIPE LINE'S NEW 120,000-BARREL BOOSTER STATION FOR REMOTE CONTROL

A dispatcher in Macungie, Pa., can completely control operations at Buckeye Pipe Line Company's new booster station 200 miles away, at Maine, N.Y. The Westinghouse-equipped station was built to step up Buckeye's capacity from 80,000 barrels per day to 120,000 barrels per day. The installation is the newest of five booster stations along a 14-inch pipeline that delivers refined oil products for 14 oil companies located from Linden, N.J., to Buffalo, N.Y. The Buckeye booster station at Maine represents the latest advances in pipeline automation.

"The station," reports the station foreman, "is seldom attended in person . . . and then by only one man. From the power transformer, switchgear and fault detection system to the electric pump motors, Westinghouse equipment enables our Allentown dispatcher to control pumps at the station, and learn from remote recording instruments the operating conditions of any one of the three motors, as well as the emergency shutoff valves. Any emergency warning lights that flash in the station will also flash in Macungie so that the dispatcher always knows whether everything is in proper working order."

The three 2300-volt Westinghouse pump motors provide 500 hp, 600 hp and 700 hp for pumping gasoline and heating oil. Pump power is converted to 2300 volts from an incoming 34,400 volts by a 2000-kva, oil-filled, outdoor Westinghouse transformer. A smaller service transformer, rated 75 kva, supplies power for lighting and auxiliary equipment.

To aid pipeline operators in achieving more efficient, cost-saving distribution, Westinghouse offers a long-term, step-by-step plan leading to economical automatic operation. It is called *Progressive Automation*. For more facts about *Progressive Automation*—call your closest Westinghouse representative. Or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. *You can be sure . . . if it's Westinghouse.* J-96157

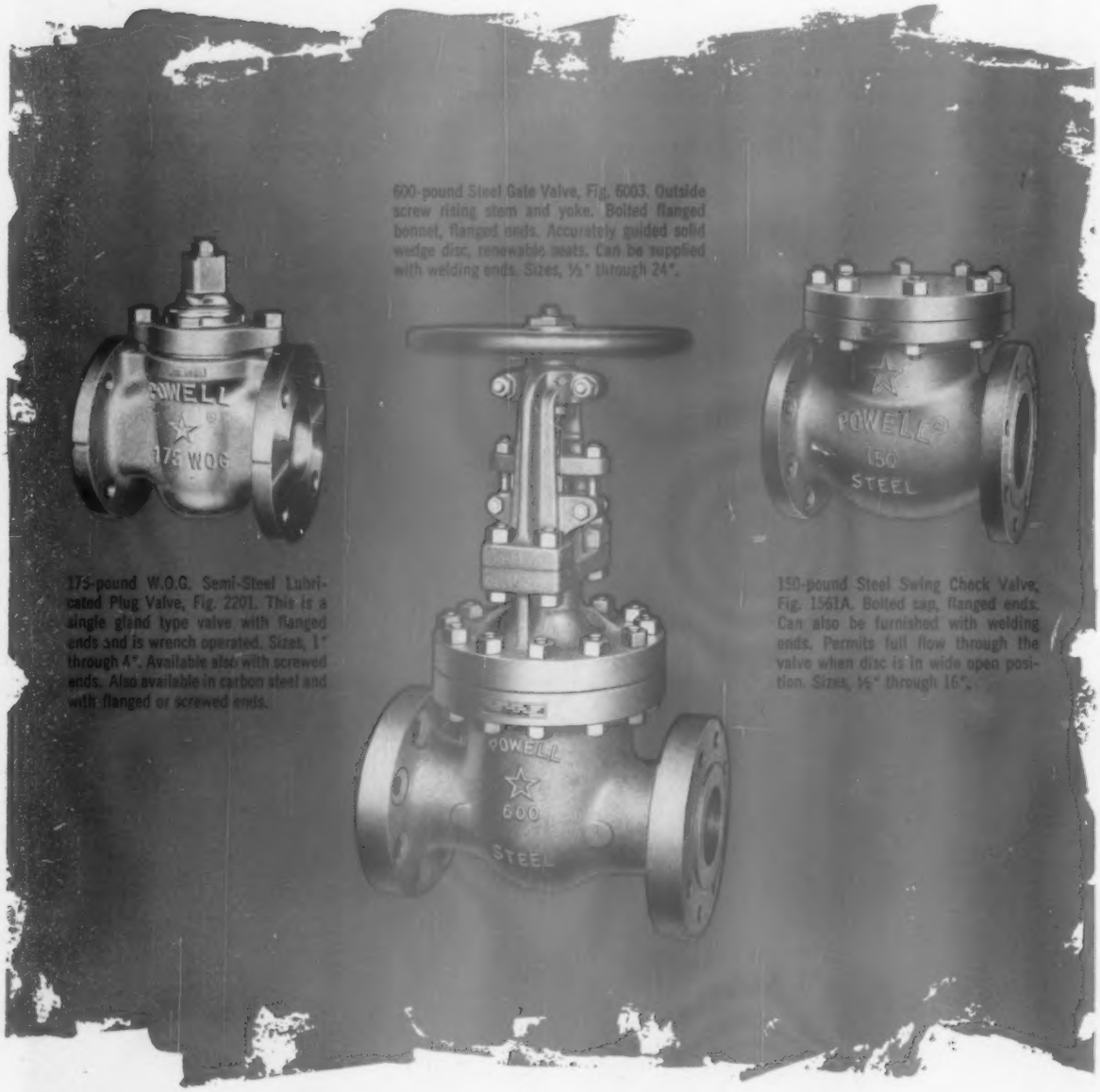
Westinghouse

RELIABLE CIRCUIT PROTECTION for station's electrical system is provided by Westinghouse metal-clad switchgear. Maintenance is facilitated by use of horizontal drawout-type DH magnetic air circuit breaker. Switchgear can be remotely or locally operated.

ADEQUATE POWER AND PROTECTION for supervisory controls, lighting and auxiliary station equipment are supplied by Westinghouse control center. Center is composed of interchangeable, space-saving, easily installed modular units.

SAVE...SPECIFY POWELL VALVES

You can count on Powell—the world's largest family of valves. Powell valves are stocked across the nation, specifically for the oil industry's needs. This means fast delivery, less down time. In short, important savings for you.
In operation, you'll find Powell valves produce big savings in maintenance because every Powell valve is the product of engineering skill and exhaustive testing that results in one thing—trouble-free service. So, specify Powell valves from your distributor, or write The Wm. Powell Company, Cincinnati 22, Ohio, for valves you can count on.



175-pound W.O.G. Semi-Steel Lubricated Plug Valve, Fig. 2201. This is a single gland type valve with flanged ends and is wrench operated. Sizes, 1" through 4". Available also with screwed ends. Also available in carbon steel and with flanged or screwed ends.

600-pound Steel Gate Valve, Fig. 6003. Outside screw rising stem and yoke. Bolted flanged bonnet, flanged ends. Accurately guided solid wedge disc, renewable seats. Can be supplied with welding ends. Sizes, ½" through 24".

150-pound Steel Swing Check Valve, Fig. 1561A. Bolted cap, flanged ends. Can also be furnished with welding ends. Permits full flow through the valve when disc is in wide open position. Sizes, ½" through 16".

115th year of manufacturing industrial valves for the free world

POWELL PETROLEUM VALVES

THE WM. POWELL COMPANY CINCINNATI 22, OHIO

you get

REASSURANCE

with these HALLIBURTON Cementing tools!

When cementing a well with weak or porous zones, you need the best available formation protection . . . against cement slurry from creating "formation damage" across the pay zone or to support the cement column and help prevent the slurry loss into any zone caused by a squeeze action from the cement's own weight. These Halliburton tools can aid in avoiding many of these and other potentially harmful problems. . . .

FORMATION PACKER SHOE— A unique combination tool **GUIDES AND FLOATS** the casing string in, using the dependable Halliburton Super Seal Float Valve . . . it provides **CIRCULATION** of fluid through the end of the casing shoe prior to setting . . . it **PACKS-OFF** the open hole below to protect low pressure formations from cement contamination during cementing . . . and helps **PREVENT** cement slurry from backing up inside the casing above the Formation Packer Shoe by use of the super seal back pressure valve, a feature part of each tool.

"DV" PACKER CEMENTING COLLAR is equipped with internal steel sleeves which open and close slot-type cementing ports to permit staged primary cementing of casing. In operation, the rubber packer element expands out against the wall of the hole or casing to help seal off the annulus as the tool is opened prior to the second (upper) stage of cement. Available in 4½", 5½", and 7" casing sizes from stock. Most other sizes available on special order as requested.

HALLIBURTON CEMENT BASKET — An inexpensive but very dependable tool when placed at one or more points on the casing string or liner . . . helps to **PROTECT** weak or porous formations from fluid or cement slurry entry . . . also helps **SUPPORT** the column of cement above until it takes the initial set.

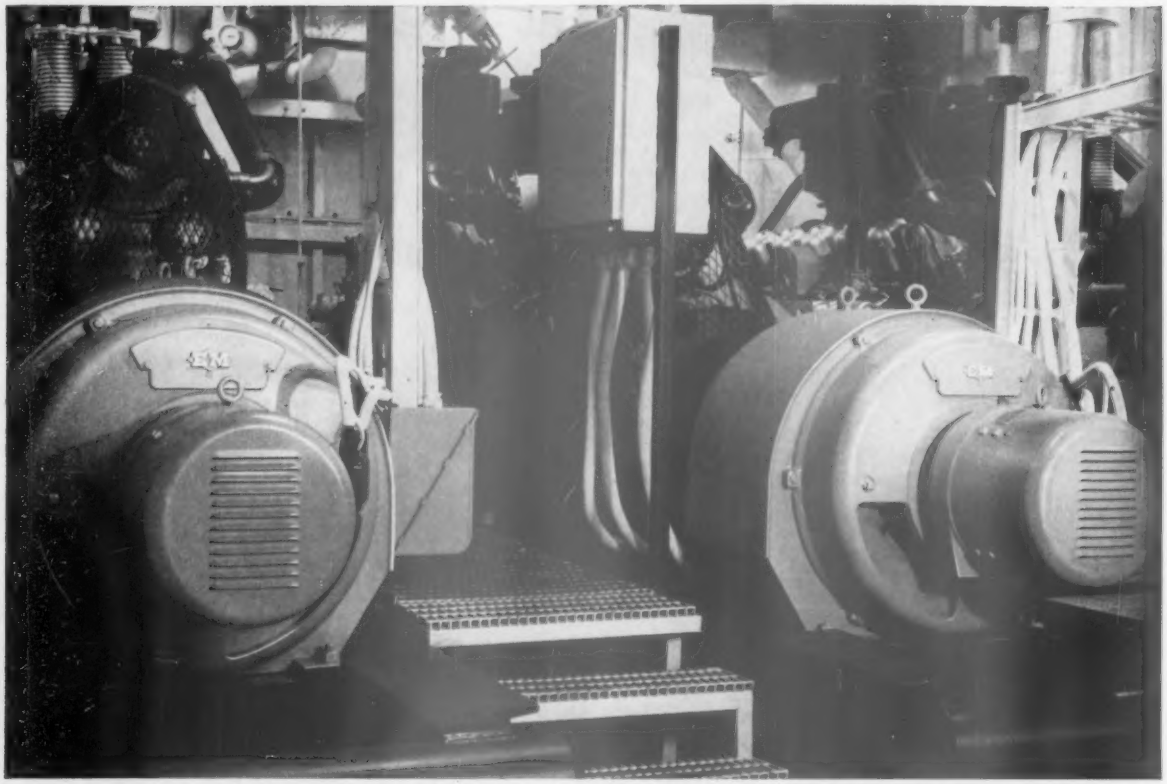
These features are typical of the attention to detail in research, design and engineering that becomes a part of every Halliburton product.

Ask your Halliburton Representative about these Effective, Efficient Tools! Available in all popular casing and liner hole sizes.

CEMENTING SERVICES

Halliburton
COMPANY · DUNCAN, OKLAHOMA

275 Service Centers . . .
just minutes away from your well



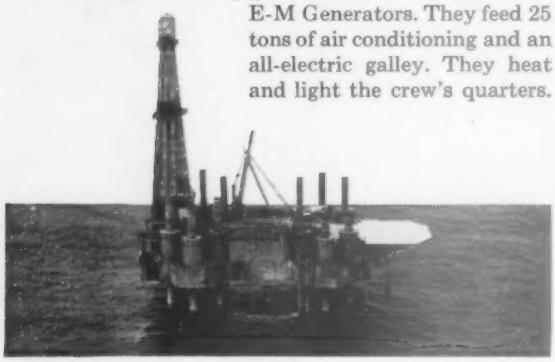
"Mr. Louie", designed by Universal Drilling Company and operated by Reading & Bates Exploration Company, gets its a-c power from two 300 kw, 0.8 pf, 900 rpm, 480 volt E-M Synchronous Generators.

Aboard offshore drilling rig "Mr. Louie", E-M Generators provide

Hard Working Horsepower, Easy Living "Housepower"

Working power aboard "Mr. Louie" comes from these two E-M Synchronous Generators. They supply power to the hydraulic jack system pump motors and to the many auxiliary motors pumping drilling fluids and water and compressing air. They also supply power for all lighting and communications.

"Mr. Louie's" living power comes from the same E-M Generators. They feed 25 tons of air conditioning and an all-electric galley. They heat and light the crew's quarters.



Hard working E-M Generators like these are widely used throughout the petroleum industry. Their extraordinary dependability has earned them acclaim among builders and operators of offshore drilling rigs. Built well above commonly accepted industry standards, E-M Generators require a minimum of attention.

They are backed by years of E-M experience in designing and building large, rotating a-c electrical apparatus for oil industry applications. Design simplicity and meticulous attention to detail assure you of long E-M Generator life and peak efficiency.

Call your nearby E-M Field Engineer for further information. He'll be glad to help you with any offshore a-c power problems you may have. Also, write the factory for a-c generator Catalog Sheet No. 259.

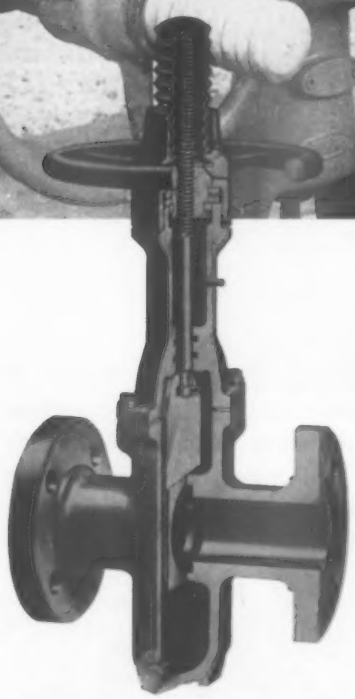
ELECTRIC MACHINERY MFG. COMPANY
Minneapolis 13, Minnesota

E-M

2100-TPA-2207

Specialists in making generators do **EXACTLY WHAT YOU WANT THEM TO**

4" W-K-M Pressure Sealing Gate Valves serve as emergency shut-off for regulator handling hot P.B.C. at 440 psi, in natural gasoline plant.



Floating Seats Make Sealing Easy

Seats are specially formulated elastomer molded to a hardened steel insert. When the gate closes, line pressure forces the gate against the downstream seat making a tight seal. The upstream seat floats against the gate to maintain an upstream seal

Emergency shut-off is a cinch with W-K-M's Pressure Sealing Gate Valve

A unique W-K-M seat design makes line pressure do most of the work — sealing the seats to positive shut-off, upstream and down. But easy operation is only part of the story.

W-K-M's new Pressure Sealing Gate Valve is ruggedly dependable. It automatically compensates for seat wear, automatically relieves excessive body pressure. And on-the-line overhaul is a simple matter.

Wherever you need a smooth-operating valve for pressures to 720 psi and temperatures to 250° F., specify W-K-M's new Pressure Sealing Gate Valve. Sizes 2" through 30" — at leading distributors.

WRITE FOR CATALOG 1200

W-K-M

DIVISION OF ACF INDUSTRIES
INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS

6009

Memo to Management:

TO PUMP OR NOT TO PUMP *EFFICIENTLY* IS THE QUESTION and PEPA has the answer

The question of dependable, efficient power for oil field pumping has been answered time and again with economical utility electric power. In most instances there is no substitute for the savings in maintenance, money and manpower provided through the use of purchased electric power. And this record of efficiency is not restricted to any one section of the petroleum industry. From the oil fields to the refinery it will pay you to investigate possible savings you may derive. Contact your Utility Electric Power Company for details.

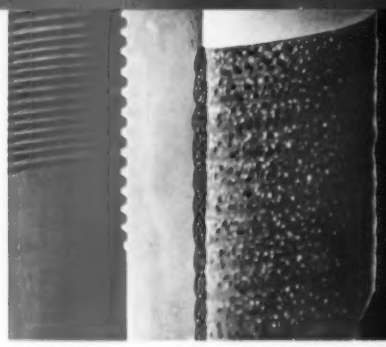
A list of P.E.P.A. members will be furnished on request

PETROLEUM POWER ELECTRIC ASSOCIATION

BOX 35006, DALLAS 35, TEXAS

Inarclad 60

the newest, longest-wearing hard banding



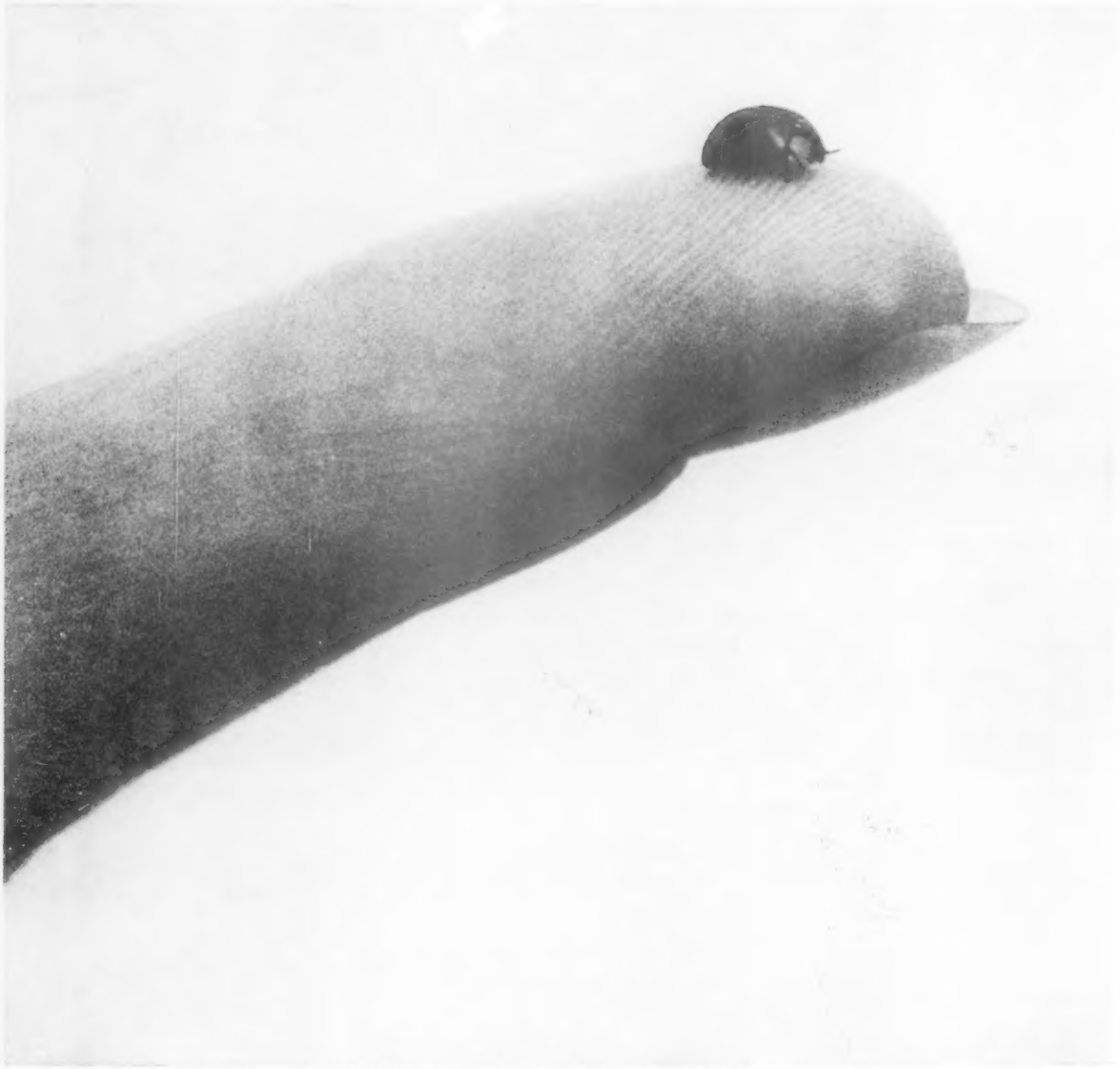
a full
3 inches
on every
standard
application

REED

Reed is proud to announce the newest, most effective method of hard banding tool joints. This new process, "INARCLAD-60," is the result of Reed's accelerated research program. This program entailed several years of research and major expenditures for capital equipment. New production facilities control the entire process from pure tungsten to the INARCLAD-60 applied on the tool joint.

Reed's research in the laboratory and in the field has developed the optimum hard banding for more abrasive resistance and therefore longer tool joint life. Reed now offers, as standard tool joint hard banding, three different applications of tungsten carbide, each of which covers a full three inches on the joint.

For complete details, call your local Reed man or write — REED ROLLER BIT COMPANY, P. O. BOX 2119, HOUSTON 1, TEXAS.



When you fly away home—fly Braniff

Remember: "Ladybug, ladybug, fly away home"? We suggest that you fly home or wherever your business takes you on Braniff—if it is near one of the 50 U. S. cities or 10 Latin American countries we serve. We think you'll enjoy it. (We think that ladybug would have preferred going via Braniff, too.)

On Braniff we cater particularly to humans. (Not ladybugs.) With the most modern equipment—Boeing El Dorado 707 Super Jets, for example. With lavish meals, gracious Silver Service, an on-time record that usually leads the field, charming hostesses who will make you feel very much at home and who speak your language. (On international flights, your language and one or two others.)

Test our extravagant claims. Especially for travelers in the Oil and Gas business. For example, the rich oil lands of South America are only a jet away. Buenos Aires, Rio, Lima, Bogotá, are a few of the many possibilities. If your business takes you to New York, Chicago or Texas, Braniff offers always the finest service to these points.

When you fly away from home, fly Braniff. And when you're ready, fly back on Braniff, too. We're convinced you'll like it both ways. That's why we say: You belong on Braniff.

BRANIFF
International
AIRWAYS

Inadequate fire protection. Result: a staggering fire loss at this refinery.

This fire need never have spread!

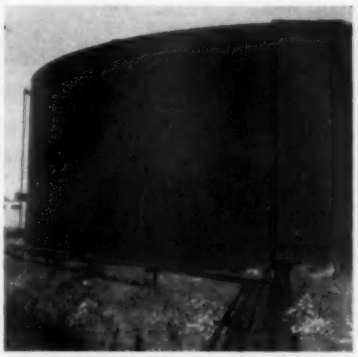
This tank fire did tremendous damage. 30 hours after it started, it was still crumpling storage tanks, buckling railroad cars, twisting track.

Grinnell ProtectoFoam Systems could have saved many of these tanks

When fire breaks out, a Grinnell ProtectoFoam System is ready to go into action. It quickly spreads a uniform blanket of fire-choking foam that covers and extinguishes the blaze. Surrounding tanks are saved.

Grinnell offers you fire protection systems for petroleum products, chemicals, alcohols, solvents, paints, liquefied gas. You benefit from 90 years of fire protection experience when Grinnell designs and installs your systems.

Free 16mm. Sound-Color Film. Grinnell's 35-minute film — "Fire Protection Through Research" — demonstrates all types of special fire hazards, and how to guard against them. To borrow this film — without charge — write: Grinnell Company, Providence 1, Rhode Island.



Grinnell ProtectoFoam protection. This bulk oil storage tank is guarded against destruction by fire.

GRINNELL

FIRE PROTECTION SYSTEMS SINCE 1870

Another Feather In Our Cap

POW-R-FRAC

New Tool Added For Standard Completions

Pow-R-Frac, a money-saving wireline fracturing service, has been added to Welex's STANDARD WELL COMPLETION services.

Designed for use in cased or uncased holes 5½" and larger, Pow-R-Frac saves you money by:

1. Reducing usual fracturing expenses; or
2. Frequently eliminating other fracturing expenses entirely.

This is *another exclusive* Welex service for well completion work.

For years Welex has led in offering the most complete selection of services for standard completions, as well as other types of completions.

Today Welex's Super Dyna-Jet*, one of the standards of the industry, is the finest perforating gun available. Other Welex *"standards of the industry"* for standard well completions include Link-Jet* and Torpedo-Jet*.

Welex also offers the most complete choice of auxiliary services for standard completions:

- Gamma-Neutron Surveys
- Correlation Gamma Surveys
- Wireline Bridge Plugs
- Production Packers
- Welex Bear Gun
- Squeeze Cementer
- Flowmeter Surveys
- Jet Pipe Cutter

No other company offers such a complete package.

These services, coupled with Welex's years of experience in every type of completion, make Welex your best choice every time.

COMPLETE WIRELINE Welex SERVICES

WELEX

A Division of Halliburton Company

General Offices. 1728 Old Spanish Trail, Houston, Texas

**Trademark of Jet Research Center, Inc.*

"Sometimes I Think We Could Treat the Oil Just by Setting a Drum of Visco on the Lease"

Reports on Emulsion-Breaker Performance with Visco 485 ... A Typical Visco Formula

Visco 485 is one of dozens of emulsion-breaker formulas that Visco has developed for specific production areas and well conditions. It has taken off like a rocket—often producing dry oil to storage on leases where tank rolling was routine . . . and proving once again that "the tough jobs go to Visco"!

Here are a few instances where Visco 485 has solved difficult treating problems—one of which led to the optimistic statement in the headline.

Rough Gas-Cut Oil and Acid Water

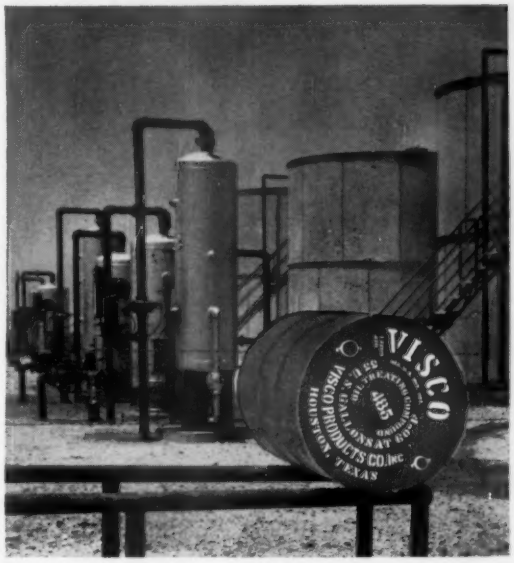
First 200-barrel tank from this new well had had 12 gallons of chemical and as much as 150° of heat . . . 1.0% water was still held up. Five gallons of Visco 485, and 30 minutes' rolling were all it took to sell the tank at 0.2% water.

Cut Chemical Feed 66%

Retreating was common on this lease. 80 to 90 barrels of oil per day took 1½ gallons of chemical. Test of Visco 485 produced 0.1 to 0.2% water in oil with only ½ gallon per day treatment. Results are uniformly good; superintendent plans to put Visco 485 on all remaining leases in the field.

Lowered Gas Heat Bill $300/Month

High tank bottoms, high heat, high treating costs—then Visco 485 and Visco 958 Paraffin Inhibitor were plant tested. Chemical consumption dropped from 10 quarts/500 bbls. to one quart 485 and 2 quarts 958. Tank bottoms disappeared. Heat was lowered from 125°F to 70°F for a $300/month gas bill saving. Lowered treating costs with Visco are capped with better oil quality.



Marvel Treater and 485 Cut B.S. & W. 20%

Oil from a new well was 19° gravity, pour point 51°F., 54% asphalt, 21% B.S. & W. Visco 485 was thoroughly dispersed in this heavy crude with a Marvel Treater. Result: 0.4% B.S. & W. Tests without the Marvel Treater could not bring B.S. & W. below 2.3%.

Visco sells or leases Marvel Treaters as an added Visco service to producers. Detailed data will be sent promptly on request.

Try Visco On a Tough One

Pick a well that is giving you emulsion-breaker troubles . . . high treating costs, tight emulsion, tank bottoms or heating problems. Let your Visco Field Service Man make a plant test for you. Odds favor him to come up with answers that can help you cut costs—and get dry oil, too. Call or write for Visco action today.

VISCO PRODUCTS COMPANY
Incorporated
A Unit of Nalco Chemical Company
1020 Holcombe Boulevard **Houston 25, Texas**

Deutsche Nalco-Chemie, G.m.b.H., Frankfort, Germany
Nalco Italiana, S.p.A., Rome, Italy
Nalco de Mexico, S.A. de C.V., Mexico, D.F., Mexico
Nalco de Venezuela, C.A., Caracas, Venezuela

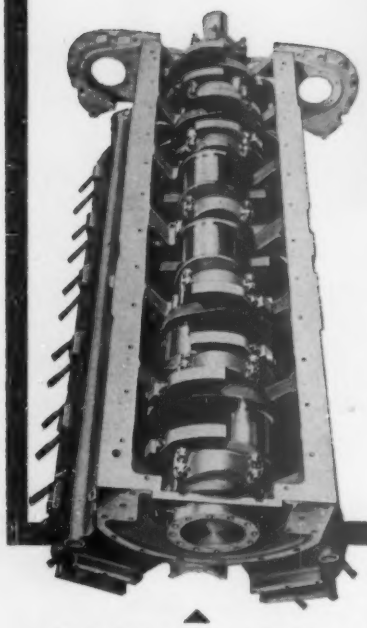
Visco® . . . *Serving the Oil Industry through Practical Applied Science*

Visco CHEMICALS
Visco SERVICES

ALL...or any part

WAUKESHAS
are your *finest*
OIL FIELD ENGINES
(Diesel . . . LP Gas . . . Natural Gas)

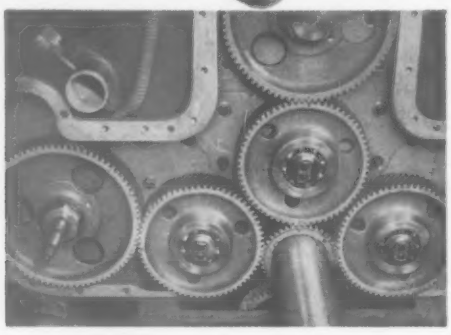
- **Favorites for Over 40 Years**
- **Rugged Construction • Precision Machining**
- **Balanced Assemblies • Modern Design**
- **Quality Control of Materials, Assembly, Testing**



Crankshaft and main bearings in place in a typical Waukesha V-12 oil field engine. Note heavy flanges, thick bearing webs, rugged long-life construction.

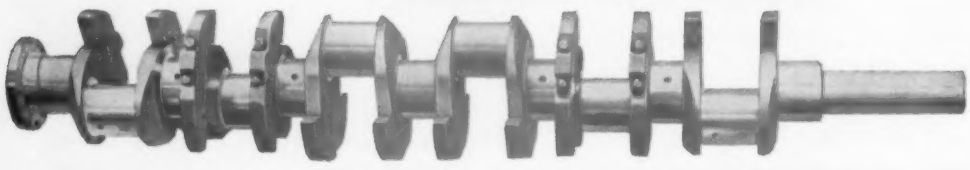
Precision-built and balanced rod assemblies, matched with pistons. Pressure oiled, mirror smooth, heavy pins. Replaceable bearing shells.

Removable wet cylinder sleeves of close-grained alloy iron, finished for oil retention and long life. Heavy duty, aluminum alloy, oil-cooled pistons.



Wide-faced helical cut timing gears are flood oiled. Materials selected for long, quiet life and accuracy. Gears and all elements in the power train, from pistons to flywheel, are precision-machined in Waukesha shops under Waukesha Quality Control.

Rifle-drilled, drop-forged, heat-treated crankshafts, precision-ground to exacting Quality Control standards. Note extra large bearing areas. Statically and dynamically balanced.



503

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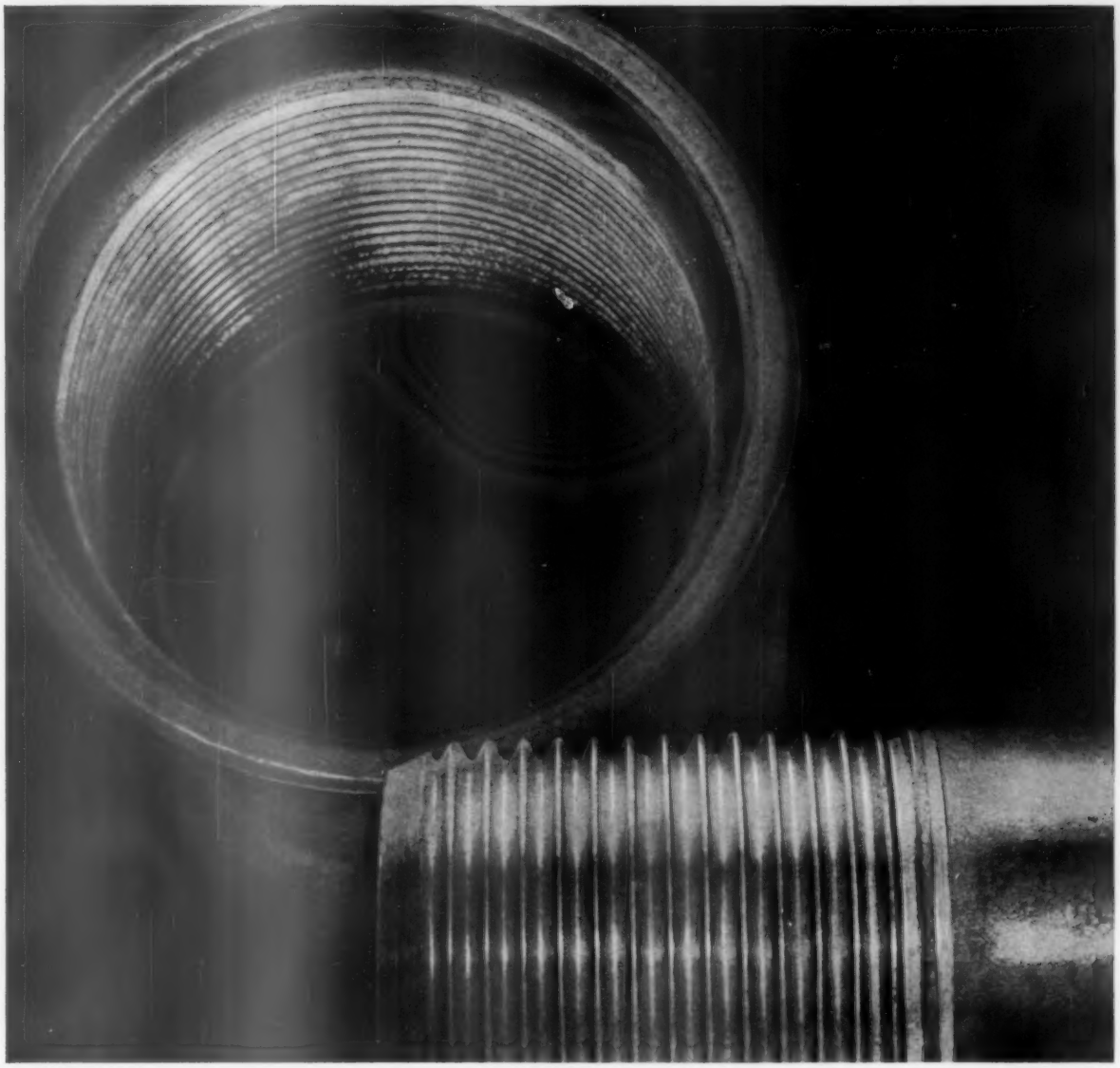
Factories: Waukesha, Wisconsin and Clinton, Iowa

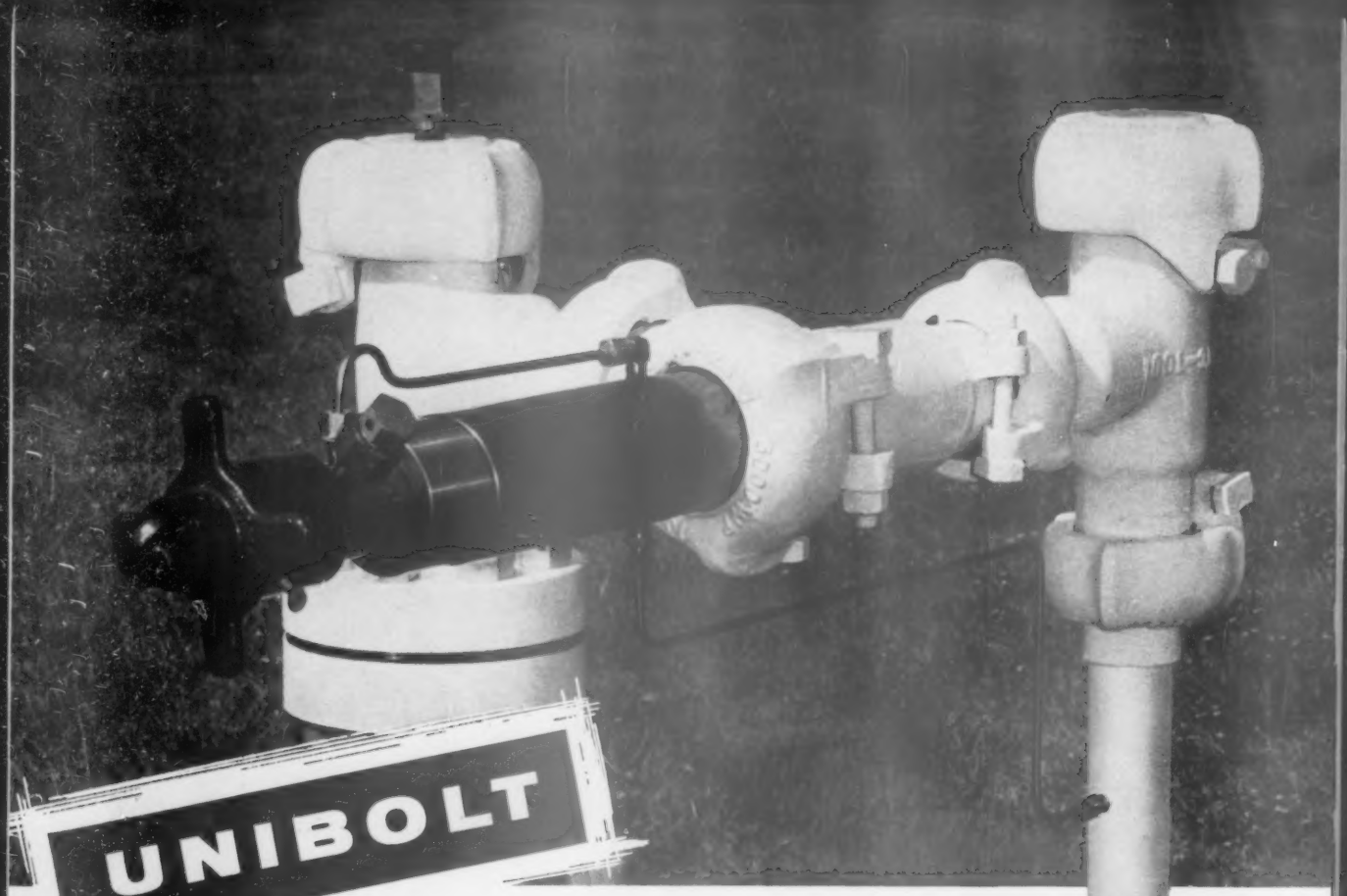


Look at the *precision threads* on CF&I Tubing and Casing

There's not a weak link in the lot. Every thread has the right lead, taper, height and size. The result is seamless tubing and casing that has *extra* strength and is pressure tight where it needs it most—at the critical area of the threaded connection.

CF&I Oil Country Casing and Tubing meet API STD 5A specification and are available in sizes from 2⅜" to 9⅝" O. D. Contact your nearby CF&I sales office or distributor for speedy delivery.

The Colorado Fuel and Iron Corporation
Denver • Oakland • New York
Sales Offices in All Key Cities



Pressurematic Valves

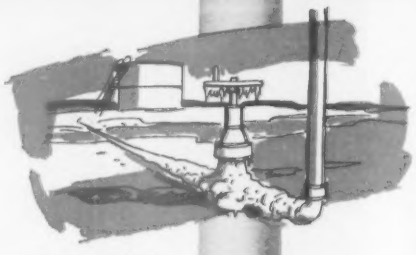
Provide dependable, low-cost insurance against all flow-line hazards

Here is a valve that does the work of two valves yet costs little, if any, more than a good high pressure valve. It is both a high-low safety and a Christmas tree wing valve.

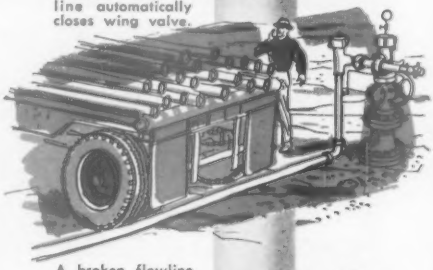
The UNIBOLT PRESSUREMATIC VALVE combines all of the time-tested and proven features of the Unibolt Adjustable Wing Valve with a novel automatic actuating accessory. The valve closes instantly when a predetermined pressure balance across the seat is disturbed. The actuating mechanism consists of a small piston which is exposed to well pressure and a larger piston which is exposed to flowline pressure. A broken flowline or open valve, for example, in the production system, would lower the flowline pressure and thus instantly close the valve. Once closed, the valve may be easily opened and set manually for automatic operation. The downstream or low pressure line may be tapped at any remote point and thus embrace any desired portion of a gathering and treating system. Offshore and other remotely controlled wells could be shut in automatically in case of fire, ship collision, etc. The unique design lends itself to many such applications.

Send for literature or contact your nearest Unibolt sales representative.

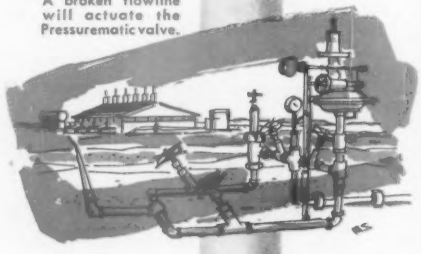
YOU CAN CONVERT YOUR UNIBOLT ADJUSTABLE WING VALVE TO "PRESSUREMATIC." The regular UNIBOLT Adjustable Wing Valve can be readily converted to "Pressurematic" by replacing the stem/bonnet assembly with the Pressurematic unit.



Freezing or hydrate formation in flowline automatically closes wing valve.



A broken flowline will actuate the Pressurematic valve.



Failure of a pressure regulator on pipe line gathering manifold would shut in the well.

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THORNHILL CRAVER CO.

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is better than good...

IT'S THE FINEST ROTARY HOSE MADE

Goodall Rotary Hose is the finest hose made—a strong statement, but one that is proven day after day, year after year.

Because Goodall is *the top quality rotary hose* you receive a one-year warranty with each Goodall hose you buy. A warranty that contains no limits on working pressures. Only the finest hose made—only Goodall with its high burst pressure built into the hose—could make this guarantee. Why not make your next rotary hose Goodall; you get greater value for each dollar spent when you do.

These exclusive features are available only with Goodall Long-Life Rotary Hose:

The Barney Coupling

The Goodall Safety Clamp

The Goodall Repair Service

The Goodall One-Year Guarantee

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TRENTON, N. J.

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Stocking Distributors: Texas and Louisiana—Houston Oil Field Material Co., Wilson Supply Co., Hunt Tool Co., Superior Iron Works & Supply Co., Inc., Heap Equipment Company, Iverson Supply Co.

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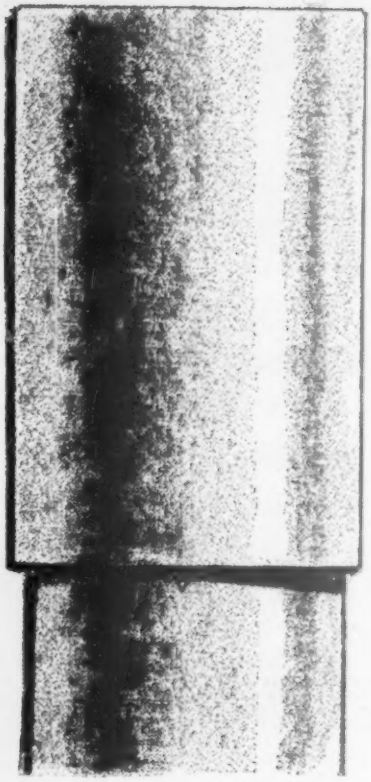
NEW!

Pittsburgh Seamless

BUTTRESS THREAD CASING



Deep wells you are planning call for special steels and special joint designs tailored to the job.

Such a safe, economical product is Pittsburgh Seamless Buttress Thread Casing made by one of the country's pioneer seamless producers. The threaded connection is virtually as strong as the body of the pipe. It can support long casing strings and withstand tremendous stresses.

Available in all popular sizes of outside diameters, new Pittsburgh Steel Buttress Thread Casing gains its extra strength from longer length of threads on casing and reduced flank angle of engaged threads. As a result, the load is distributed over the full pipe cross-section.

Rapid stabbing and spinning are assured. Since there is no internal upset, inside clearance is the same throughout the entire string.

Coupling threads engage casing threads throughout their entire length since the ¾-inch taper per foot is continuous without fast angle vanishing threads. Five threads per inch and the three degree flank angle of threads permit threads to support the full weight of casing in the well. Write for literature and further information.

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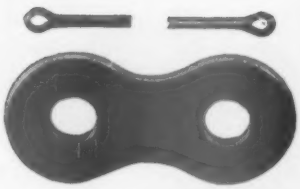

FIRST CHOICE
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NOW AVAILABLE FOR REPLACEMENT
at no extra cost!

DIAMOND PRESS-FIT
CENTERPLATE ROLLER CHAIN

. . . supplied in custom lengths with **B**ushed **C**enterplate Connecting **L**inks

(Diamond Patent No. 2,466,639)

For many years DIAMOND *Multiple Strand* Roller Chain having centerplates Press-Fit on the pins has been *first choice* with builders of heavy-duty oilfield equipment . . . for these very good reasons:

1. DIAMOND *Press-Fit Centerplate* construction eliminates wear at centerplate holes. It distributes the load uniformly over *all* linkplates, giving the chain higher fatigue strength and greater capacity for shock or continuous loads, than has been experienced with any other chain.
2. Continued uniform distribution of load, even under severe operating conditions, adds substantially to the life of the chain, reducing replacement costs and equipment downtime.

DIAMOND *Press-Fit* roller chain is now available for installation or replacement in the field. Connecting links with precision-ground center-plate bushings (BCL Links) may be fitted with *hand pressure* and have virtually 95% of the shock load capacity of press-fit links.

DIAMOND *Press-Fit* Centerplate Roller Chain, for all its proven advantages, *costs no more* than slip-fit chain. It is available in multiple-strand, custom lengths from ¼″ to 2½″ pitch, for a complete range of oilfield applications.

Order DIAMOND *Press-Fit* Centerplate Roller Chain for all replacement needs. Available from Indianapolis factory or from Dallas Factory Warehouse.

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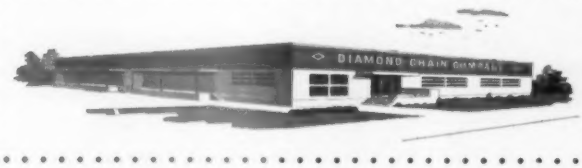

NEW DALLAS FACTORY WAREHOUSE AND SALES OFFICE ***carries full stocks of DIAMOND Roller Chains***
South and Southwest oilfield operators may now obtain overnight service on orders for DIAMOND Press-Fit Centerplate Roller Chain in *custom lengths* with Bushed Centerplate Connecting Links. Address your orders to: DIAMOND CHAIN COMPANY, INC. • 9119 Diplomacy Row, Brook Hollow • Dallas 7, Texas
Phone FL 7-6669

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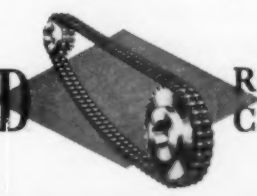

DIAMOND ROLLER CHAINS ®

Photographed at DX Sunray Oil Company, (Tulsa Refinery)

For a higher yield per dollar—Aerocat Triple A

Why more and more refineries are increasing efficiency and cutting costs with this 25% Alumina Catalyst. AEROCAT TRIPLE A® Cracking Catalyst, the first commercially successful 25% alumina catalyst, is still setting records. Its combination of extremely high activity and unusual stability provide premium cracking efficiency, high equilibrium activity, increased conversion at lower temperatures, or (compared to conventional, low alumina catalysts) reduced catalyst usage at severity levels.

Yet, with all its efficiency, AEROCAT TRIPLE A can actually save you money, compared to other synthetics of comparable performance—particularly where low catalyst turnover is possible. It yields *more* gasoline; it measurably increases octane rating, and with no increase in stack losses of the catalyst itself. The increased output takes place at the expense of a lower dry gas yield.

Isn't it time you investigated what AEROCAT TRIPLE A can do for *you?* Your Cyanamid salesman—"The Man with the Golden Rule"—will be glad to cooperate, for sharing his skill and experience with refiners is a most important part of his job. Why not call him *now?*

Basic in catalyst chemistry

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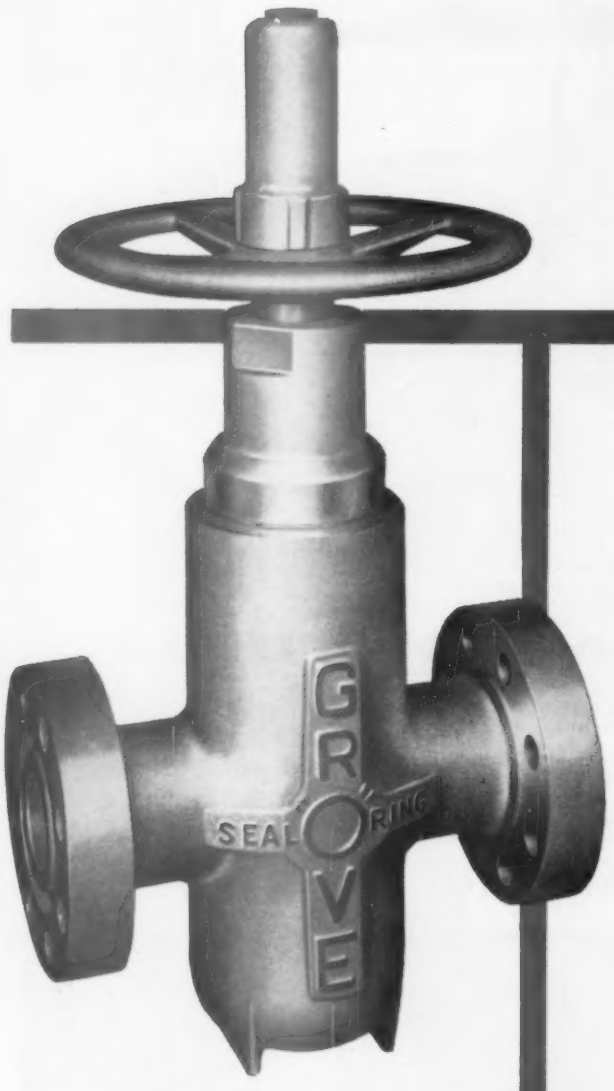
RIGHT OFF THE SHELF

These Grove series G-2 production valves are available right now in most sizes — more coming. They feature Grove Seal-"O"-Ring design and the Grove Valve **big plus** — no lubrication ever!



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Right-now shipment of standard series G-2 valves. Available in either flanged or screwed end. Sizes: 1½" through 4". Working pressure: 1000, 2000, 3000 and 5000 pounds.

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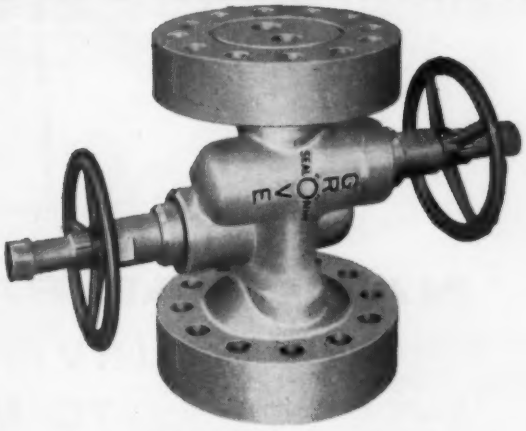

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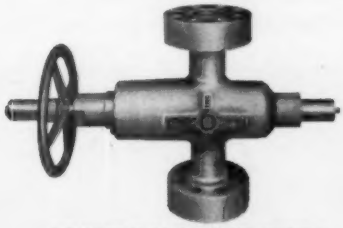
Available in 2" — 5000 #W.O.G.



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Available in 2" x 1⅝", 2" x 1-13/16", 3" x 2-1/16", and 3½" x 2-9/16" — 10,000 #W.O.G.

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Available in 1½" and 2" — 2000, 3000 and 5000 #W.O.G.

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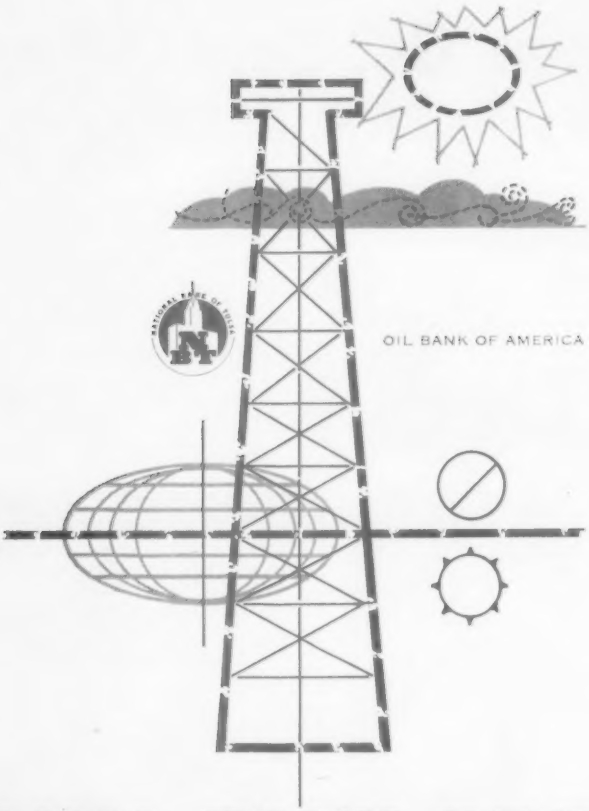

NATIONAL BANK OF TULSA

NBT is proud that its recent remodeling program has not only brought about physical changes, but has also helped to create a New World of Banking. This is especially true in NBT's Oil Department where

INVITES YOU TO ENTER A NEW WORLD OF OIL BANKING

banking men know oil as well as they know banking. You're cordially invited to enter a New World of Oil Banking by visiting the Oil Department of the National Bank of Tulsa . . . Oil Bank of America.

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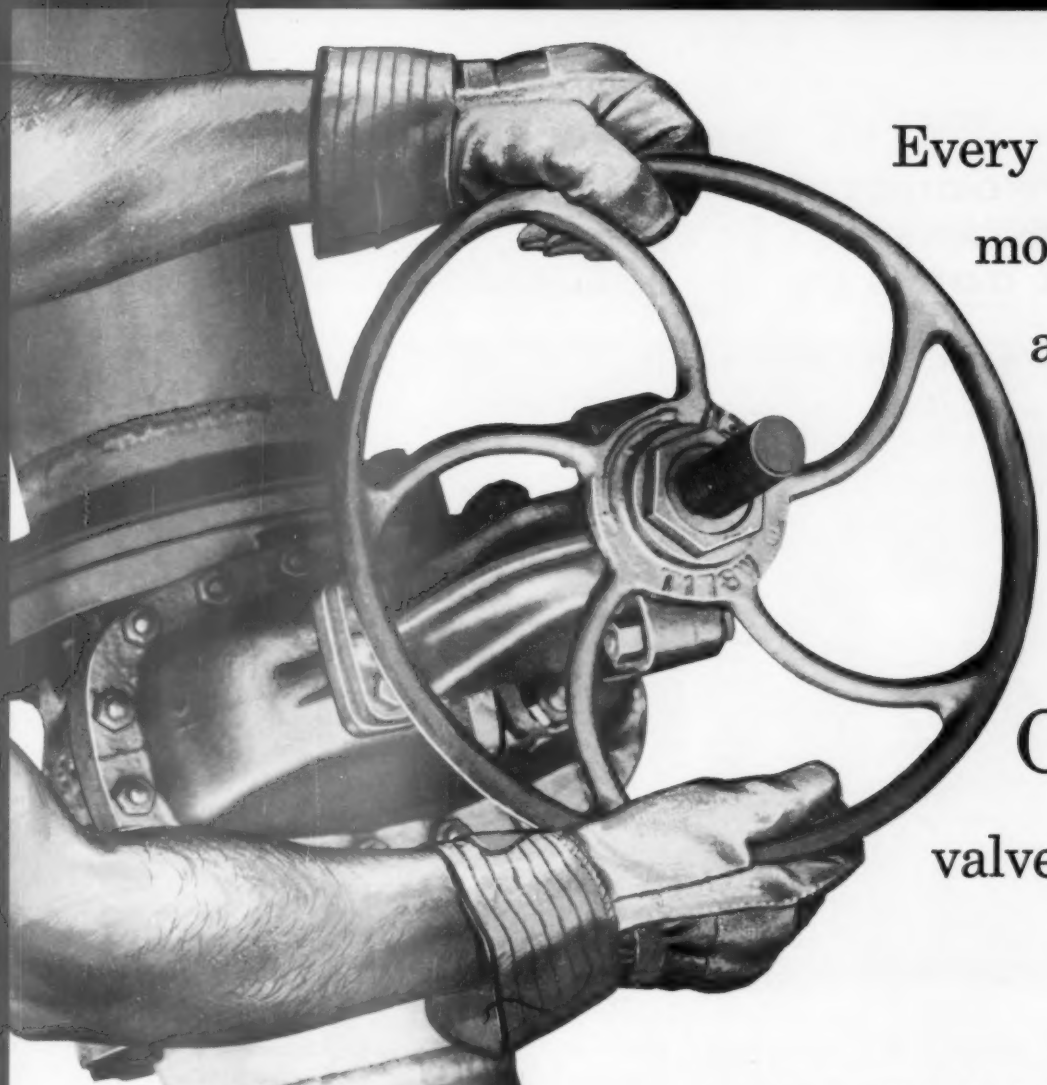

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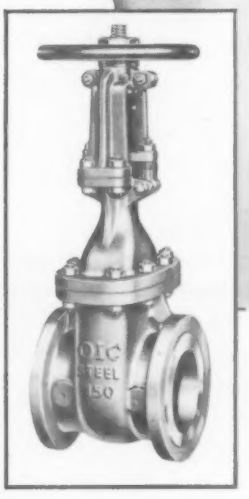
. . . because OIC has developed valves to solve the special problems of the oil and gas industry . . . valves built for continuous operation and lower maintenance cost. A variety of experience-proved materials and designs are available to meet the exacting needs of this industry in the field, in the refinery and gasoline plants wherever oil and hydrocarbons are being produced, processed or transported. Standard valve trims are available for highly corrosive and severe pressure-temperature operating conditions. Get acquainted with your local OIC distributor. He is equipped to help you with all your valve problems.

BETTER VALVES AND BETTER SERVICE FROM OIC DISTRIBUTORS



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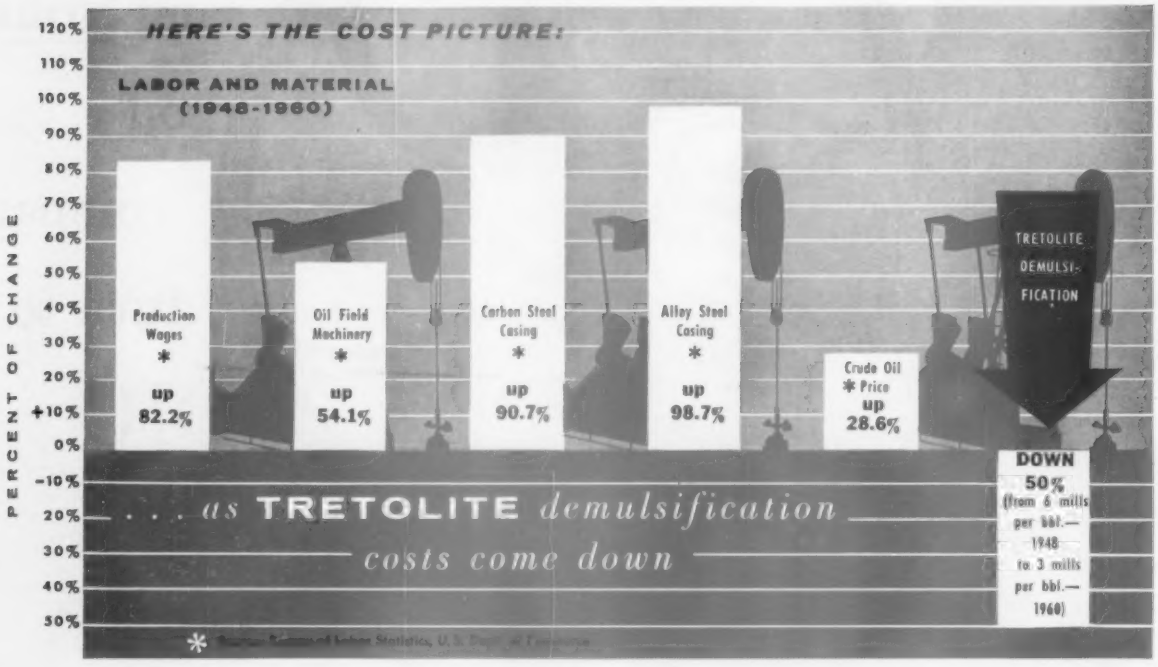
OIL PRODUCTION COSTS ARE STILL GOING UP

another
TRETOLITE SERVICE
report



. . . and here's the reason:

It's good news in a period of general spiraling costs—the average cost of Tretolite demulsification treatment has been *cut in half* as other production costs have continued to move stiffly upward!

Why? A major part of the answer lies in Tretolite research . . . a continuing program devoted to the development of newer and better formulations, to constant testing, and to improved methods of manufacture.

If you're caught in the cost squeeze, and would like to produce more salable oil at less cost, we invite you to contact your Tretolite Field Service Engineer (the "Man in the Red Car") for helpful cost-cutting suggestions.

Write now for your copy of the new TRETOLITE DEMULSIFIER BROCHURE IT'S YOURS ON REQUEST.

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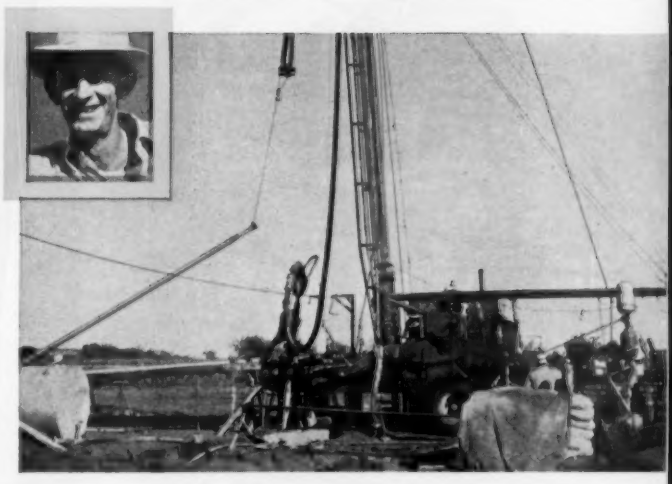
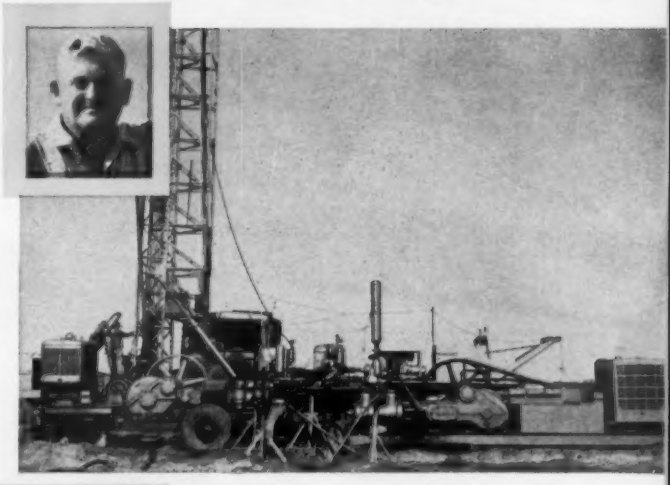
T-61-1

Drillers "sound off" on power preference



"Our International runs like new after 15,000 hours!"

W. F. Hicks, Superintendent for Davis & Davis, Inc., Coleman, Texas, ran an International UV-549 V-8 for two years, 24 hours per day, on draw works, rotary table and cat head. "When we finally had a chance to take off the head and pan, we couldn't find any wear that could be measured, felt, or seen. That International still runs like new!"



"I like International engines because they can take it!"

Andrew Dickens, Partner, Valley Oil Co., Cottula, Texas, backs his preference for International with 35 years' experience in the oil fields. He has four IH engines on this spread—a new UDT-817 and a UD-525 on mud pumps, plus two older and still efficient International diesels on drill and draw works.

"Experience proves International performance excellent!"

C. M. Pumphrey, Producers Well Service, owns three IH-powered rigs operating out of Bolling, Texas. "We get fast service and parts delivery from our IH Distributor!" says Mr. Pumphrey, pointing out another International extra. The self-propelled unit shown here is powered by an International V-8, with a U-450 pumping salt water.

For power to match your jobs, see your nearby International Engine Distributor or Dealer. He'll show you 35 models in the IH line—16.8 to 385 max. hp—gasoline, natural gas, LP gas or diesel; with special factory-made attachments for job-matched oil field service. Call him soon!

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ENGINES

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A COMPLETE POWER PACKAGE

"A great step forward with your Planetary Gears, Big Bearings and Cylindrical Crossheads."

— J. K. Butler

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7440 CHOCOLATE BAYOU ROAD -- P. O. BOX 14291
HOUSTON 21, TEXAS
August 31, 1960

Mr. Gordon P. Street, President
The Wheland Company
Chattanooga, Tennessee

Dear Mr. Street:

Our Wheland Planetary Pump is giving us increased penetration and good savings on bits. We know from more than 18 months of constant operation on 10,000 Ft. wells that our savings are substantial.

We have kept an accurate record on operating costs and all maintenance costs and are especially impressed by the low cost of fluid end expendables. The HP-16000 Pump has constantly operated near its rated capacity on more than 200,000 feet of hole in the Texas Gulf Coast Area.

We are now operating Wheland HP-18000, HP-14000, and HP-16000 Pumps and are glad to recommend them. Your new HP-16000 Pump design is a great step forward with your planetary gears, big bearings and cylindrical crossheads.

Yours very truly,

OIL PRODUCTION MAINTENANCE, INC.

J. K. Butler

J. K. Butler, President

WHELAND PLANETARY
HP-16000 PUMP
Duplex Power Slush Pump
7¾" x 16", 600 H.P. at 65 RPM

Wheland HP-16000 Planetary Pump owned by Oil Production Maintenance, Inc., on location in the Gulf Coast area.

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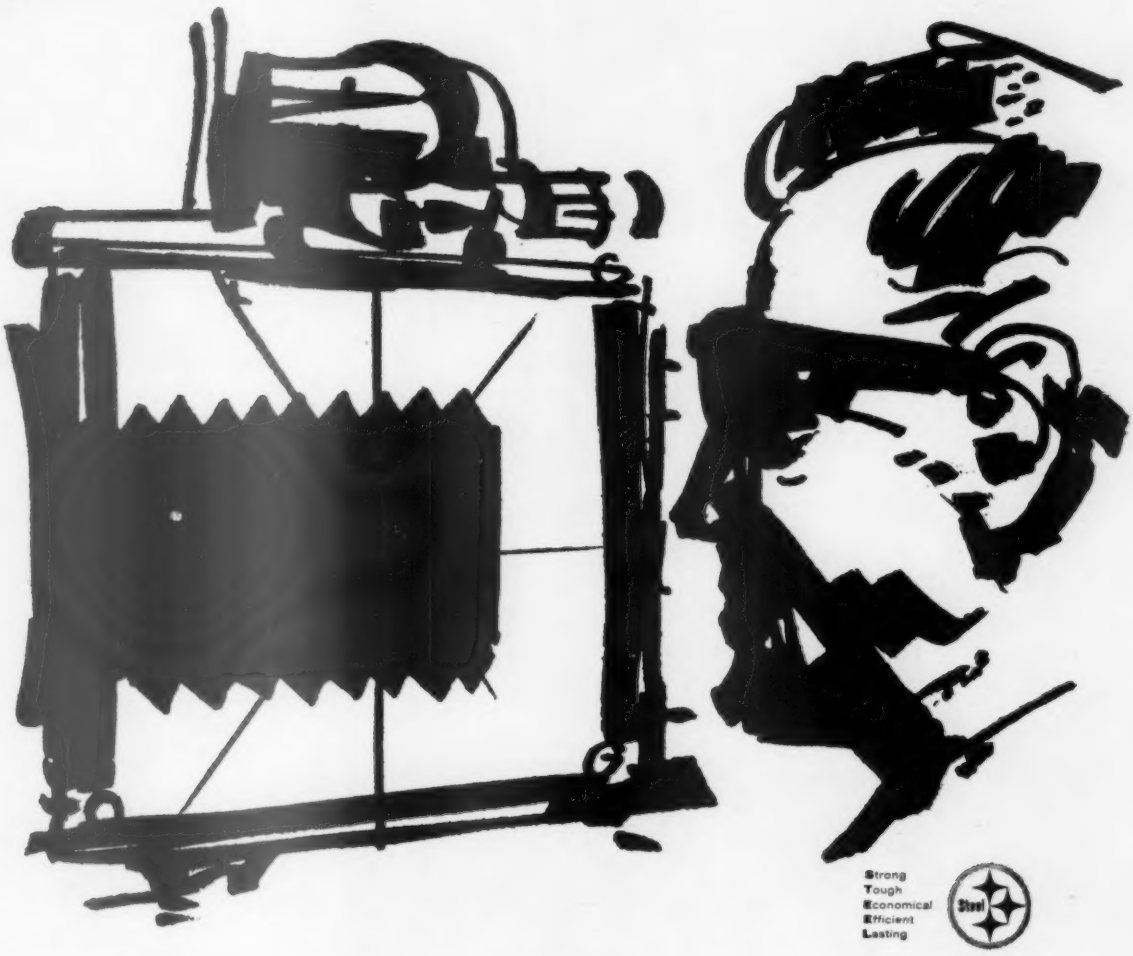
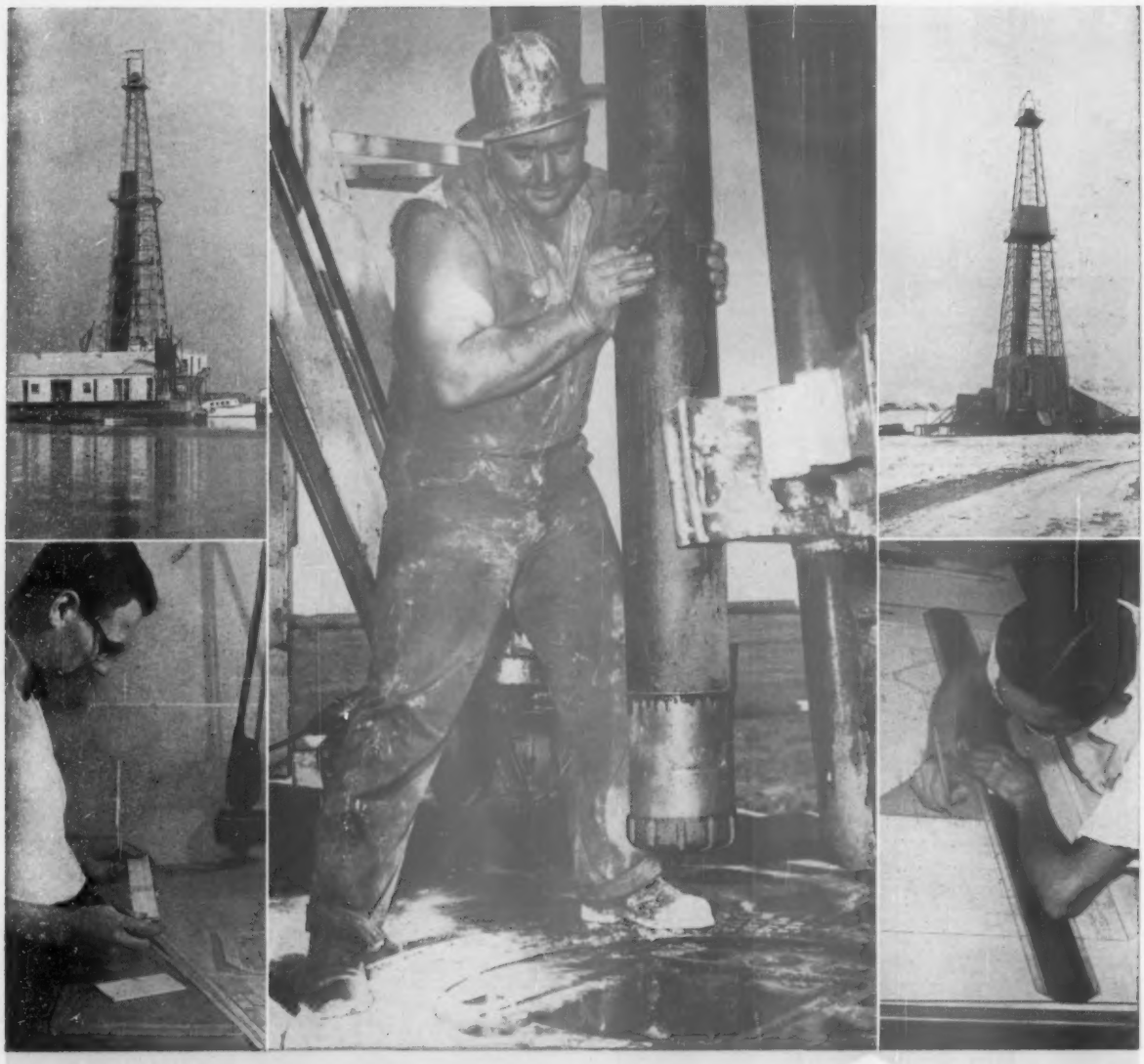


Big Bolt Plant

Quality

A bolt is a Sheffield bolt ONLY if it is a precision product—made to finest tolerance, quality-controlled from design to furnace to finish. Only big-plant resources make this possible. ▪ And only big-plant resources can assure the quick shipment you need today. The variety of Sheffield fasteners available to your quick order is almost as countless as the stars in the sky. Cap screws, bolts, rivets — you name it. New cold-forming machinery puts Hi-Strength bolts into big-plant production. More finely finished, ideal for products where bolts show and appearance counts. ▪ Metal working companies with unique problems are invited. Talk to our designers and engineers about your bolt needs. Ask your Sheffield bolt man to arrange it. **Sheffield Division, Armco Steel Corporation — Houston, Kansas City, Tulsa.**

ARMCO Sheffield Division



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With manufacturing plants throughout the world Christensen can design and deliver your "engineered" diamond bit, on time, regardless of your job location.

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All Steel Construction, extra large center pins, sheaves grooved to proper line size.

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Extra large range of sheave sizes and capacities.

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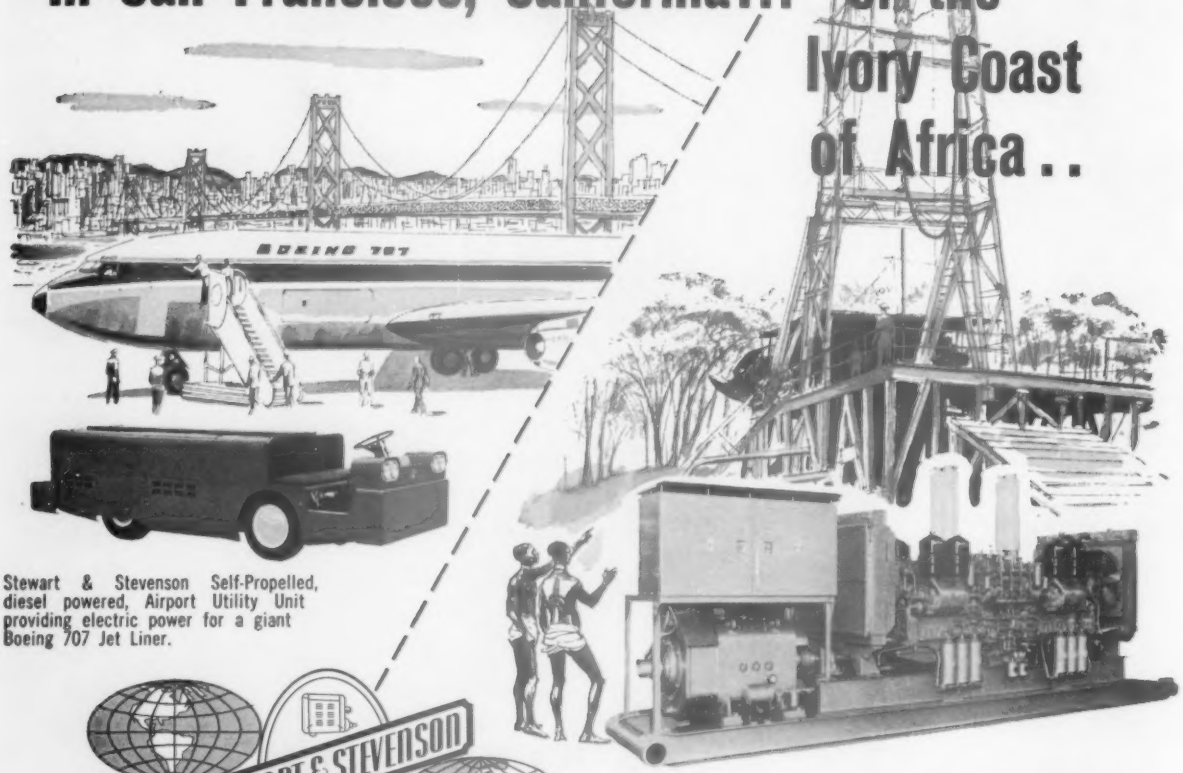

Stewart & Stevenson Self-Propelled, diesel powered, Airport Utility Unit providing electric power for a giant Boeing 707 Jet Liner.

Stewart & Stevenson RIGELECTRIC engine electric power unit supplying power for drilling operations on Laughlin Porter's oil drilling rig in Africa.

When it comes to diesel or gas engine power, Stewart & Stevenson experience and "know-how" have no boundaries.

Here again are two diesel engine power applications . . . in direct contrast and in opposite parts of the world . . . with one important characteristic in common: both were designed and built by Stewart & Stevenson Services, the world's largest distributor of diesel engines. Both power applications are serving vital industries where thousands of dollars and valuable contracts are totally dependent on the reliability and performance of this engine driven equipment.

When you need power . . . for any application in any part of the world . . . Stewart & Stevenson's experience, service organization and engineering will guarantee dependable performance. We will be glad to study your power needs and submit recommendations. Please write for additional information.

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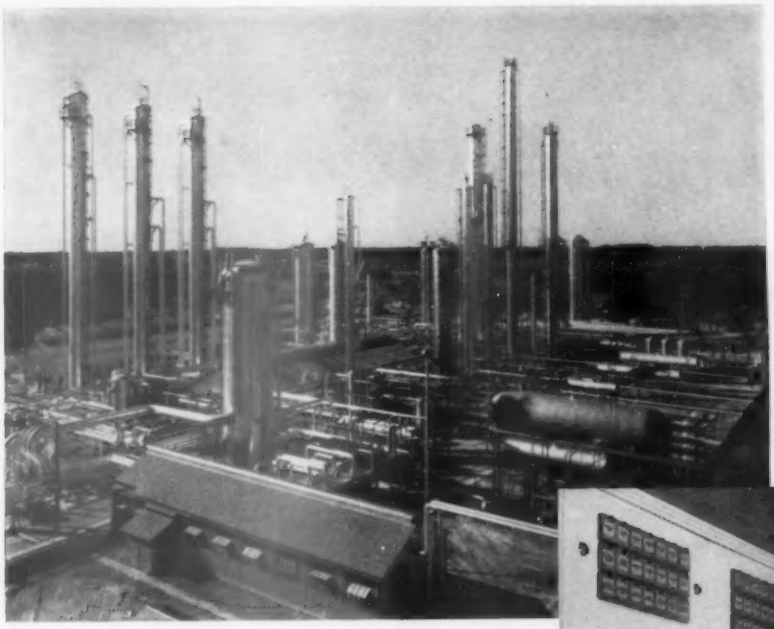
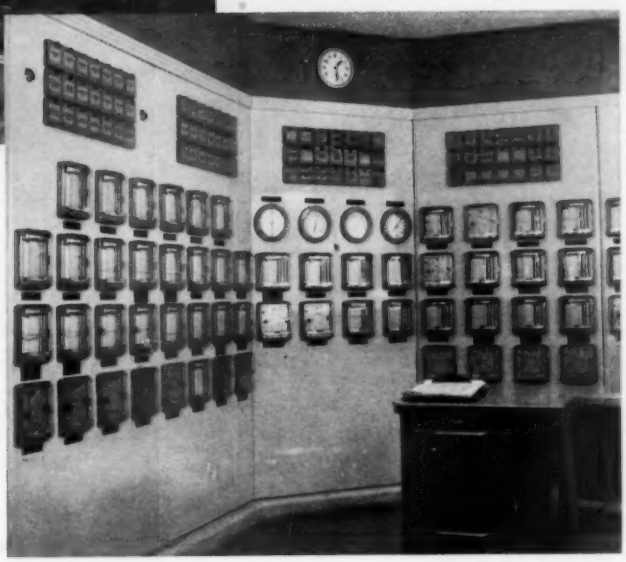


Part of the Arkansas Louisiana Chemical Corporation's new Hamilton Plant at Magnolia, Arkansas. Below, the central control panel, designed by Delta Engineering Corp. Note the compatability of the Taylor TRANSCOPE Recorders, Single-Case Cascade instruments and Ratio Relays.



Hamilton Gasoline Plant of ARKLA gets exceptionally high product purity with *Taylor* TRANSCOPE® control

Redesigned and rebuilt by Delta Engineering Corporation, Houston, Texas, the Hamilton Gasoline Plant of Arkansas Louisiana Chemical Corporation uses a variety of Taylor temperature, pressure and flow transmitters. The very compact central control panel includes scores of TRANSCOPE Recording Control Stations. It also features such innovations as Ratio Relays and Single-Case Cascade instruments which reduce panel space requirements and simplify operational control.

The plant operating personnel report that the instruments have performed to their complete satisfaction ever since the new plant went on stream.

The Hamilton Plant was designed to process a gas throughput of 400,000 MCF per day, utilizing a refrigerated, low-molecular weight oil absorption process. This involves processing 350,000 MCF of gas at 800 psig and 50,000 MCF at 575 psig from various gas fields connected to the plant. The fractionation system separates and puts into storage 200,000 gallons per day of propane, iso-butane, normal butane, isopentane and 18# RVP gasoline. It has the capacity to recover 85,000 gallons daily of ethane which could be doubled by minor additions to the plant.

Here is another fine example of the dependability and accuracy of the TRANSCOPE line of instruments and associated transmitters. Ask your Taylor Field Engineer for a demonstration, or write for bulletin. Taylor Instrument Companies, Rochester, N. Y., or Toronto, Ontario.

Taylor Instruments **MEAN ACCURACY FIRST**

CHOOSE FROM A COMPLETE LINE . . . Another reason why you get more value with Guiberson

It's swab performance that counts!

Quick-Change, Knuckle-Joint Swab
Change cups without tools in ten seconds. Type UF or Multiwing Cups float on mandrel and serve also as valves. Knuckle action permits easy running of multi-cup units by adding mandrels and cups as desired. Only three metal parts.

Type UF Swab
. . . a threaded joint swab otherwise similar to knuckle-joint swab in 2" - 3½" sizes. Slightly different design in 1", 1¼", 1½" and 1¾" sizes. Use with Type UF and Multiwing Cups.

Types UF and Undersize UF Cups Flexible all-purpose cups with heavy wall and extra length for lifting heavy loads . . . light loads, too, from great depths. Serve as valves on swabs shown. Sizes from 1" through 3½", also undersize cups for swabbing restricted tubing.

Multiwing Cups
Especially effective in fluid containing high ratio of sand. Eight upturned lips integrally molded with built-in relief features provide maximum clearance for fast falling. Pass easily through tight spots and automatically dump excess. Sizes from 1" through 3".

Guiberson cups and swabs are the result of the best engineering and field-proved experience, plus the finest, most complete product production facilities in the world.

Yes, you can count on Guiberson quality . . . and because the Guiberson line is a complete line, you can get the swab and cup you need to do any job better. The swabs and cups shown here are just a part of the nine types of cups and suitable swabs from 1" through 13".

You can count on your Guiberson representative to recommend the cup and swab combination best suited to your particular needs.

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Totally Oil-Immersed

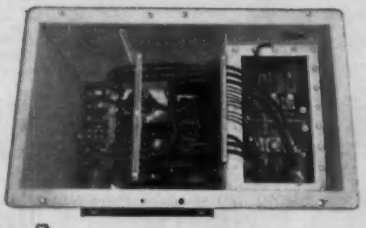
EC&M Type ZHS Starters at Southwestern pipe line trunk station

Designed for Easier Installation, Inspection and Maintenance

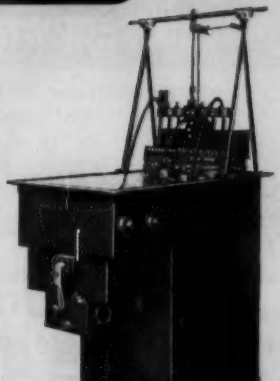
Specifically designed for Class I, Group D, Division 2, semi-hazardous locations . . . NEMA 3R (raintight enclosure). 50,000 KVA interrupting capacity.

***Fast* installation** because starters are shipped with all internal wiring complete. All leads are of anti-syphon construction.

Easy inspection • Contactor and overload relay panel may be raised, as one unit, above oil level. No disconnecting of bolts or leads. *(See lifting mechanism at extreme right.)* Safer, too . . . note view windows on each side of load-break disconnect switch.



View from above shows complete internal wiring . . . anti-syphon leads. These "ready-to-use" starters are complete with control transformer for 220 volt push button operation.



EC&M Contactor lifter raises contactor and overload relay above oil level for easy inspection. No bolts or leads to disconnect.

For literature describing EC&M's complete starter line, write for Bulletin 8131-T

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Turbocharged-Aftercooled D343 provides 420 HP maximum at 2000 RPM, electric set produces up to 250 KW.
Turbocharged only—360 HP maximum with electric set ratings to 200 KW.

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- As low as 0.387 lbs. per brake horsepower hour

OUTSTANDING PERFORMANCE
- 420 HP maximum . . . up to 250 KW
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- Precise valve action with twin overhead camshafts
- Complete combustion through four-cycle design . . . full stroke power

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- Foul-free operation . . . large single-orifice fuel injectors
- Efficient burning of wide range of fuels because of pre-combustion chamber design

LONG LIFE
- Performance-proved Caterpillar-quality components
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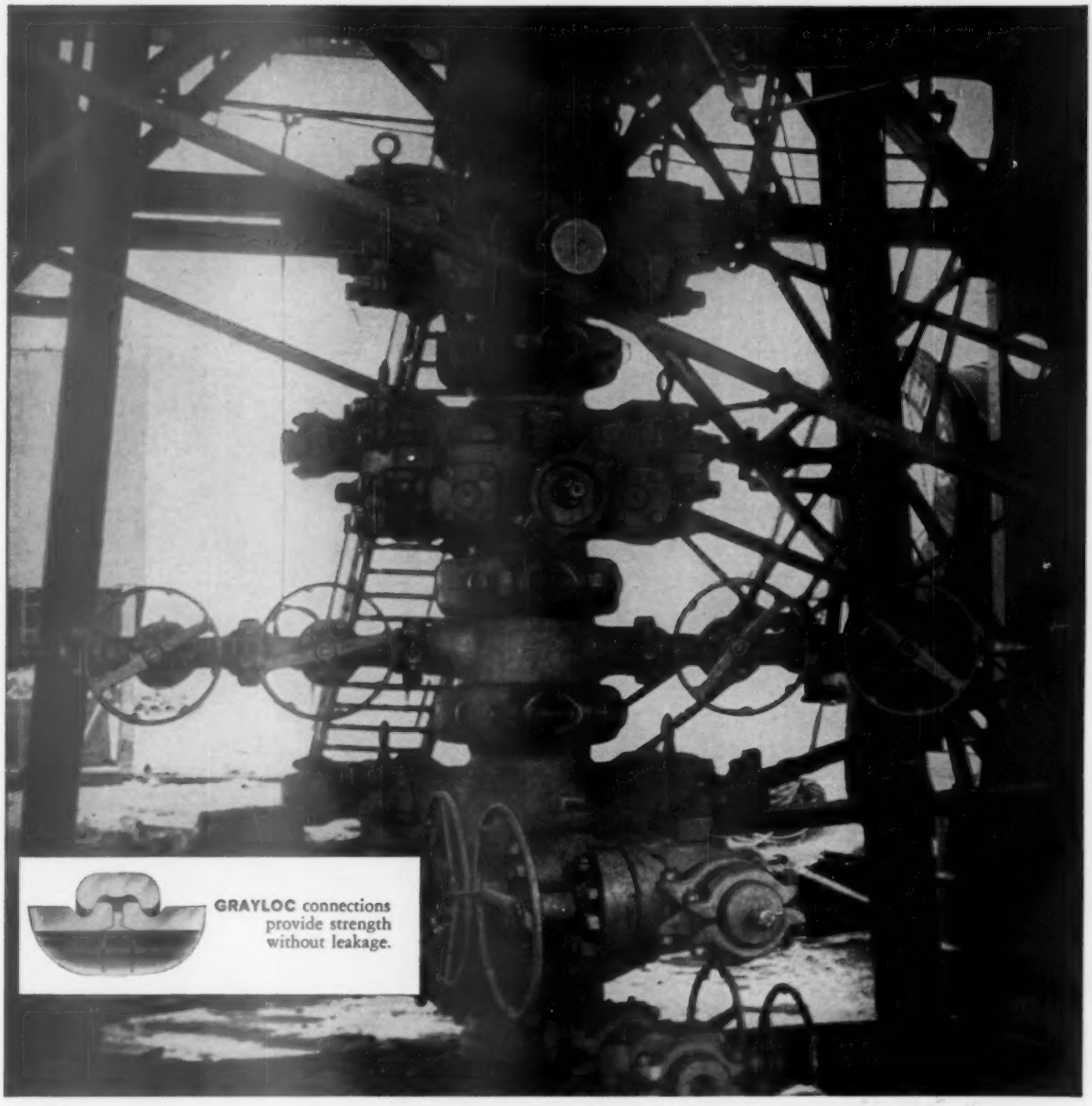

GRAYLOC on Well Head and Control Equipment Safely Withstood 7,300 PSI

This all Grayloc assembly, in use on a well in Eastern Venezuela, withstood well pressures of 7,300 psi during drilling operations — proving that Grayloc equipped assemblies provide the greatest possible blow-out protection. The assembly required no additional tightening after the original make-up.

It took a native crew less than six hours to nipple-up this Grayloc equipped well head and control assembly, and it required approximately 24 inches less substructure height than a comparable flanged hook-up.

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"This modern drive-in rig saved us almost $200 per day on day work costs, plus $1,000 on moving and rig-up costs," says Mr. Jack Ross, Production Superintendent for Kenneth A. Ellison. "We waited over two weeks for the rig we wanted, a Cardwell KM250. We'd watched these rigs closely for several months and had no doubts about putting one on this tough job. The KM250 is as fast as any conventional drilling rig normally used for this deep work, and it's much more economical. On this job, the KM250 proved its superior performance and overall job economy. Because of this, we'll be using this rig a lot in the future."

The job was performed on the Miller-Long #1, which was originally drilled to 19,634 feet. On the last trip out of the hole, the 19,600 feet of pipe was pulled and on the bank in just over 8 hours, including time to change elevators. There were no breakdowns on the job which lasted 31 days, including moving, rig-up and rig-down time.

More and more operators are finding that Cardwell Drive-In Rigs save them time and dollars on completion, servicing and workover, and perform outstandingly on medium depth drilling. Contractors who own Cardwell Drive-In Rigs are continually meeting the challenge of tougher, more complex jobs, and still making a good profit for themselves. You can, too! Call a Cardwell representative today!

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Production Superintendent,
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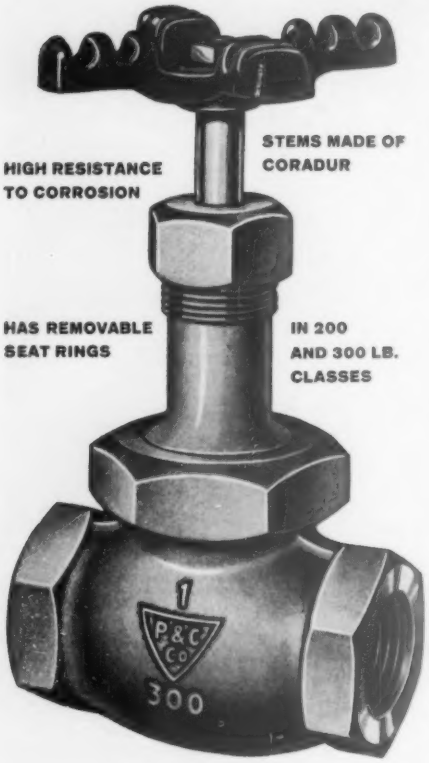
"R-P&C Bronze Valves keep performing like new"



"Valves, like any vital piece of plant equipment, must be kept in top working order at all times. And with R-P&C Bronze Gate and Globe Valves this is no problem, for these valves have **renewable seat rings.** Made of durable 500 Brinell Stainless Steel, or Copper Nickel, seat rings can be screwed in or out if replacement is necessary. Moreover, when servicing is required, the union bonnet permits fast, easy access to internal parts."

The **stems** of R-P&C Bronze Valves are made of special Aluminum Silicon Bronze (**CORADUR**) to afford high resistance to corrosion and seizure. Their **full plug** design makes them ideally suited for throttling in steam, water, oil and/or gas service. Air-cooled, **cross-type handle** gives added ease of operation.

These features, and many others, are available with R-P&C Bronze Gate and Globe Valves in the 200 and 300 pound classes.

Contact your R-P&C distributor for complete information about these valves as well as R-P&C's complete line of electric furnace iron, cast steel, bar stock and forged steel valves.

R-P&C VALVES

ACCO

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BENDIX BROADENS ITS DIESEL FUEL INJECTION CAPABILITIES WITH ADDITION OF SIMMS LINE

Through a recent agreement with Simms Motor Units, Ltd. of London, England, Bendix will market and manufacture Simms fuel injection equipment for diesel engines in the United States. Thus, diesel engine manufacturers and users will benefit through an extremely wide range of equipment for their fuel injection needs.

Equipment manufactured by Scintilla Division of Bendix today is serving the fuel injection needs of leading U. S. diesel builders, particularly in the high-horsepower class. Now, with the addition of the Simms equipment, Bendix can offer multi-cylinder pump units adaptable to small- and medium-sized engines. Simms equips many makes of British diesels, as well as Ford diesel-powered farm tractors built in this country.

The nation-wide organization of Bendix® fuel injection equipment distributors and service dealers will perform equivalent functions on the Simms units, with prompt deliveries and efficient service. For details, write:

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Sidney, New York

THE Bendix CORPORATION

Export Sales & Service: Bendix International Division, 205 East 42nd St., New York 17, N. Y.

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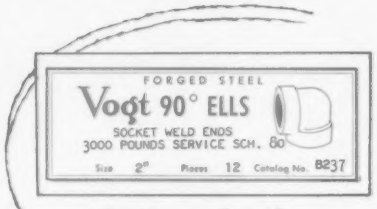

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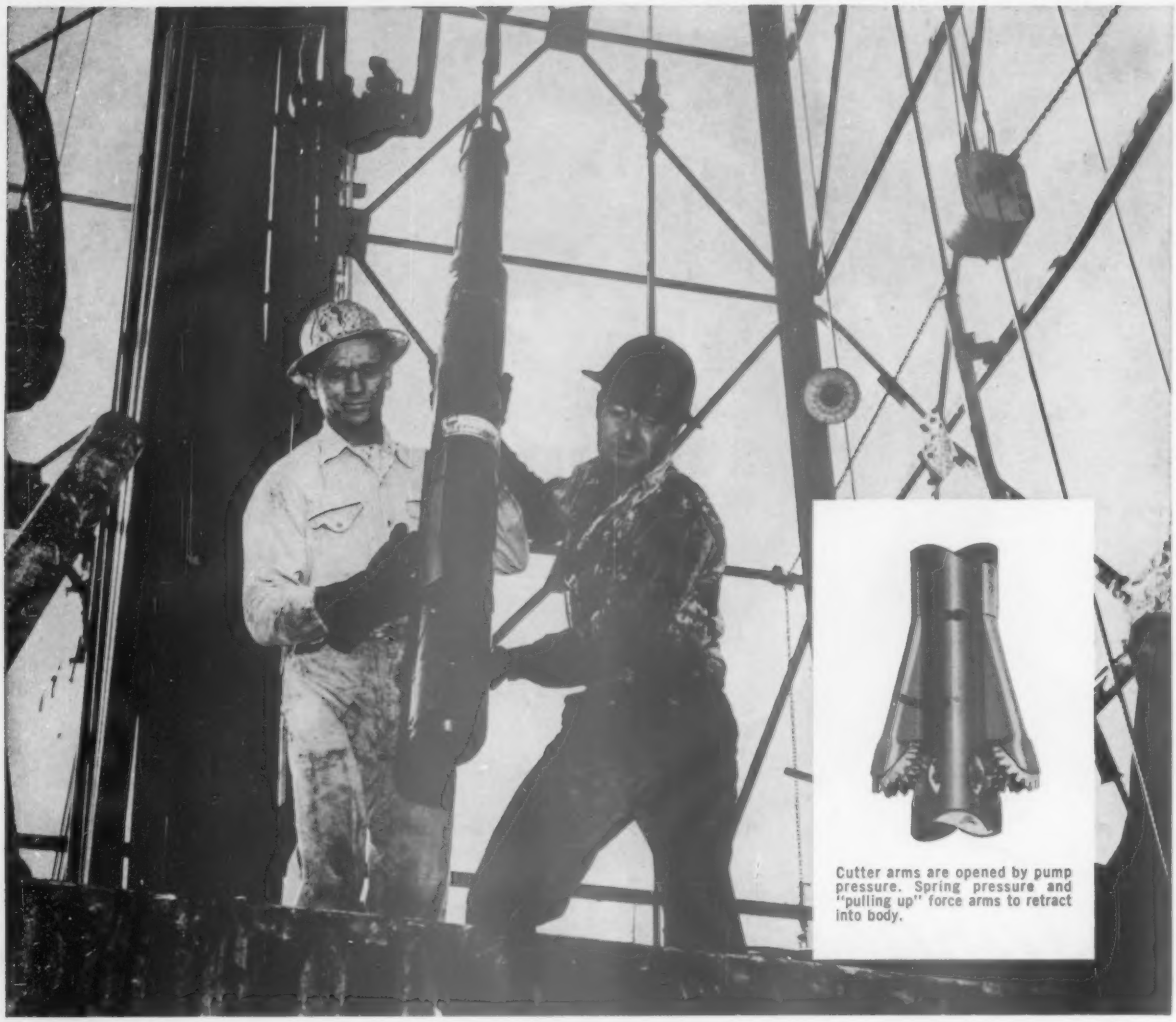

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New Servco Hole Opener drills like a rock bit ...opens hole up to 3 times faster!

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- Choice of cones for the most efficient cutting.
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Just a casual look at the new Servco Expandable Hole Opener tells you it's a *simple*, rugged tool, built to take a lot of hard downhole use. A closer look reveals the secret of its exceptionally fast penetration—the use of *rock bit-style* cones. In operation, the Servco Hole Opener drills like a rock bit. Actual job records show holes can be opened (up to twice the drilled diameter) three times faster than with conventional hole openers. Cementing, gravel packing... any casing clearance operation... can be completed faster and more effectively, resulting in important rig-time savings.

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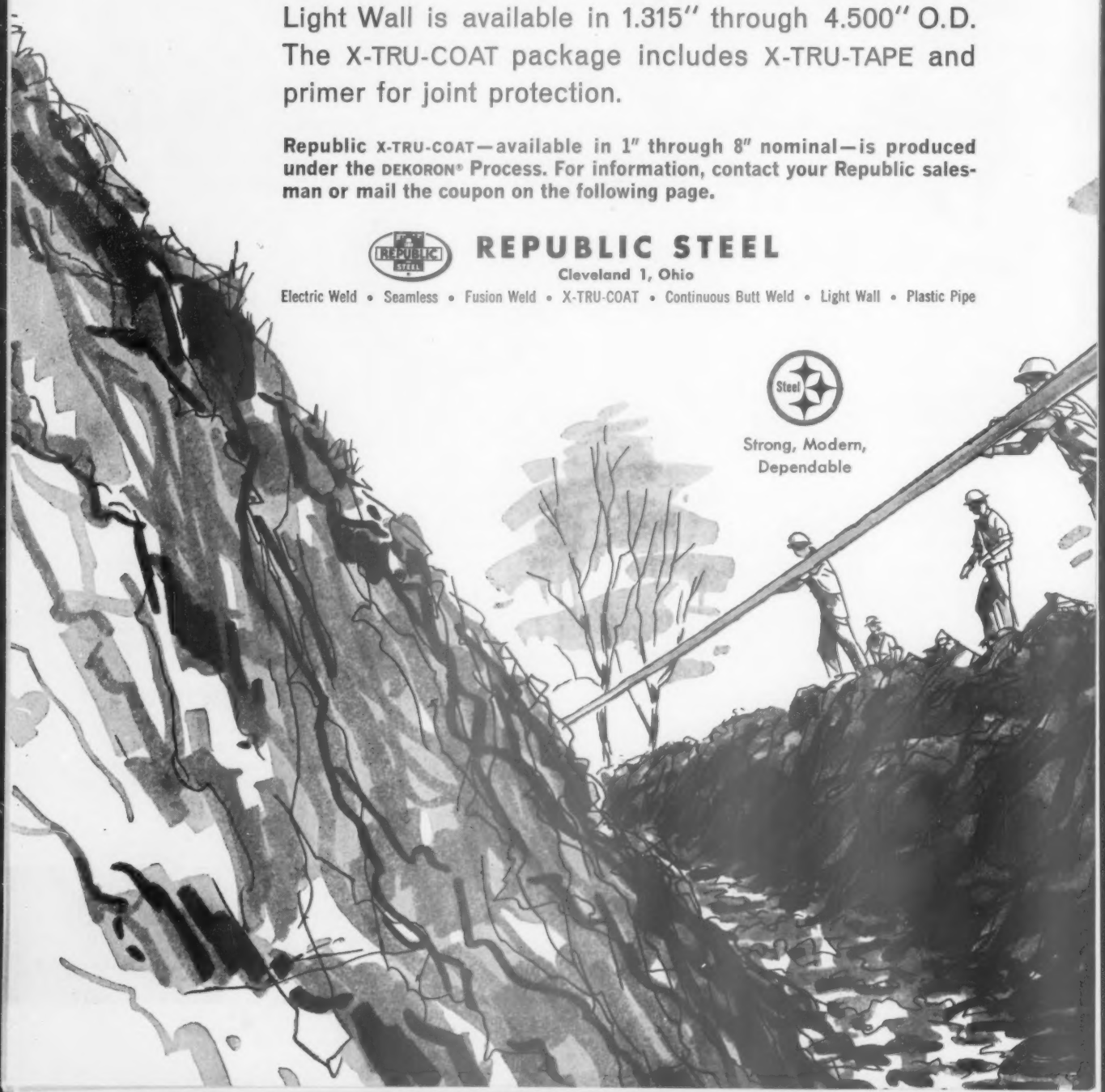

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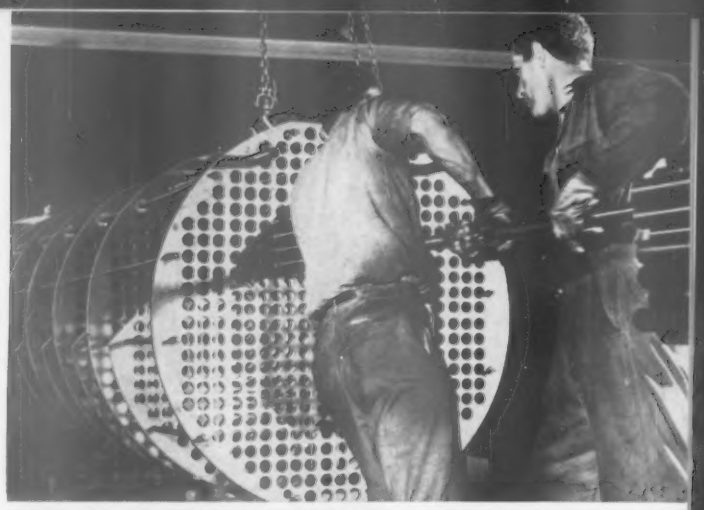

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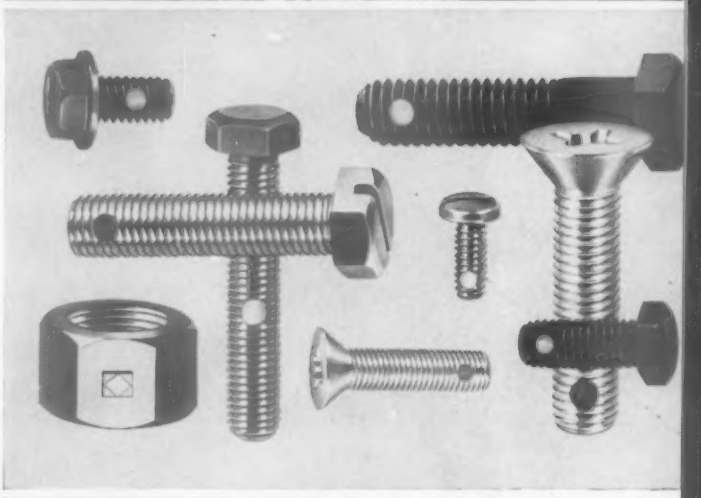
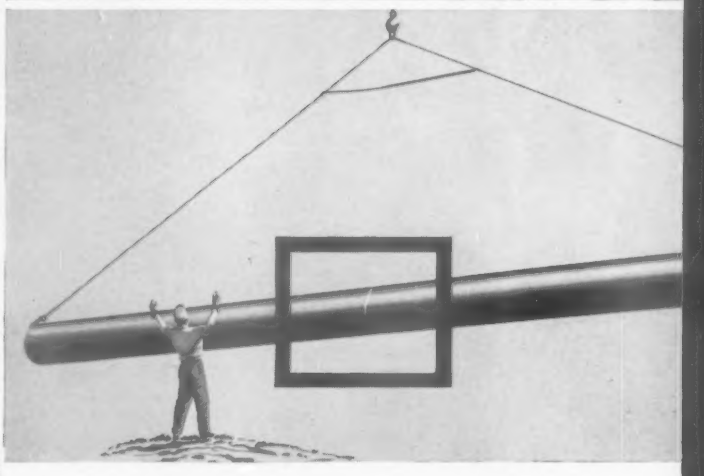


SPECIAL NYLON INSERTS in Republic NYLOK® Bolts and Nuts assure permanent lateral thrust against opposite mating threads. This single unit answer to vibration problems eliminates the need for cotter pins, set screws, lock washers, or wiring of heads. NYLOK Fasteners resist age, moisture, alcohols, esters, ketones, refrigerant gases, boiling 40% caustic soda, common solvents, and temperatures ranging from −70° to +250°F. Return coupon for details.



STANDARD LENGTHS OF FUSION WELD ARE JOINED by submerged arc welding to produce Republic SUPER-SPAN in 60-foot lengths. Only 88 of these joints are required to make up a full mile of pipeline. Straight and strong, Republic SUPER-SPAN is famous for constant circumference, uniform wall thickness, and accurate size. This pipe lines up quickly and easily for precision field welding. Available in 24″ through 30″ O.D. Send for information.

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- ☐ ELECTRUNITE® Heat Exchanger Tubing
- ☐ NYLOK Fasteners
- ☐ Republic SUPER-SPAN Fusion Weld

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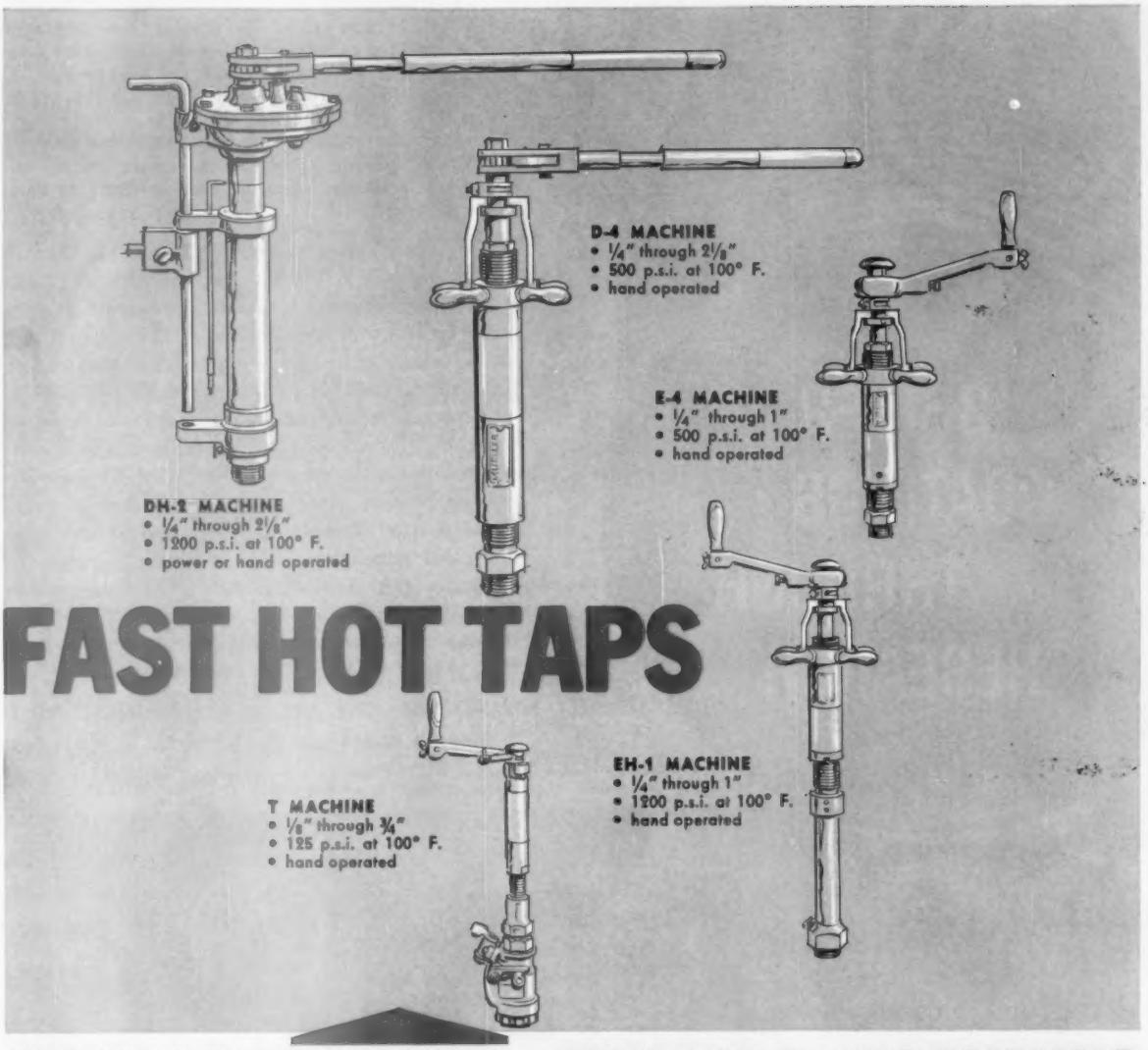

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permit you to tap any size line! Small connections can be made quickly, safely, simply . . . under full line pressure . . . without loss or blowing of line fluid . . . without interrupting flow! ■■■ These dependable, "service-proven" Mueller Drilling Machines also perform all of the many No-Blo operations . . . such as, stopping-off lines or reconditioning valves and tees . . . when used with Mueller No-Blo Products in the same size range.

dependability in operation . . .
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• Furnishing the best possible plastic coatings to the oil industry is the number-one task at Plastic Applicators. Therefore a continuous high-priority research program is conducted in our own laboratories and in those of independent research organizations under contract to Plastic Applicators.

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They Say—

It's not passed yet

Dear Sir:

Something is amiss with your usual accurate reporting . . . see Industry Briefs, page 97, February 6 issue.

The hike in Utah occupation tax from 2 to 5% has not been passed. S.B. 133 proposing such increase has been introduced and is presently scheduled for the sifting committee.

Also, it is too early to predict affirmative action by the House and Governor Clyde. As citizens of this state and members of our industry, we want to be heard before the final votes are recorded.

A. P. Lorfing
Continental Oil Co.
Salt Lake City

Reader Lorfing is right about the status of this bill.—Ed.

There's a difference

Dear Sir:

Whatever else may be said about the Miller article, ("Radiation Surveys Can Find Oil," OGJ, Feb. 13, p. 124) let me hasten to record my admiration for your policy of providing a free market place of ideas for controversial oil-finding methods.

My purpose in writing this letter is to disassociate geochemistry from radioactivity and further to isolate "hydrocarbon geochemistry" from the word geochemistry as a generic term.

There are innumerable side effects of the vertical migration of hydrocarbons to the surface. One of these side effects might conceivably be measured by radioactivity or it might not.

The prime effect, and that which can and s h o u l d be measured directly, is "hydrocarbon" itself, or more specifically, ethane and heavier hydrocarbons. Since the only source of "ethane plus" in nature is a petroleum accumulation, it follows that the most significant of measurements is "ethane plus," and

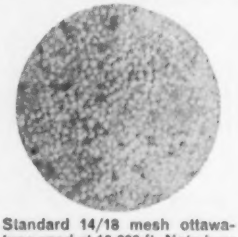
New proppant boosts well production!

REYNOLDS ALUMINUM FRAC-SHOT™

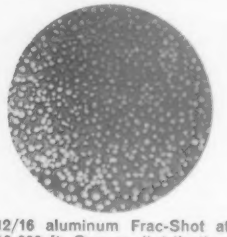
Aluminum Shot—New Propping Agent

Reynolds Frac-Shot is a new propping agent which makes well fracturing more effective, more profitable. Since its introduction a few months ago, Frac-Shot has proved itself in hundreds of wells, boosting productivity many times over conventional fracturing methods.

The new propping agent is simply aluminum "shot"—malleable pellets of aluminum, carefully sized and processed for well servicing. It is available from all major service companies.



Standard 14/18 mesh ottawa-type sand at 10,000 ft. Note how grains crush and pack together, blocking flow.



12/16 aluminum Frac-Shot at 10,000 ft. Sparse distribution permits free flow.

Photos courtesy Pan American Petroleum Corporation and The Atlantic Refining Company.

Better Flow from Fractures

Two qualities make Frac-Shot a more effective propping agent than conventional materials: (1) It doesn't crush and "pack" the fracture, and its sparse distribution permits more flow. (2) The Frac-Shot pellets are malleable, deforming slightly under pressure to provide even better fracture support.

Where sand alone may crush and block the flow in a fracture—or be pressed into the fracture walls, Frac-Shot pellets keep fractures open and permit fluids to flow freely.

Tests Prove Frac-Shot

In Kern County, California, a well that had been previously fractured with walnut shells at about 12,150 feet was producing 21 b/d net. After treatment with approximately 3,200 lbs. of Frac-Shot at about the same depth, the well showed a steady increase until it leveled off at 182 b/d. It is expected that production will be sustained at this level.

In another recent field test at 7,050 ft. in the Wilcox formation in Texas, 4,500 lbs. of Frac-Shot was used as a "tail-in" after 13,000 lbs. of sand. The gas production in this well was increased from 130,000 c.f.d. to 700,000 c.f.d. Previous history in this field indicated that conventional fracturing techniques would have produced only 260,000 c.f.d.

Use and Cost

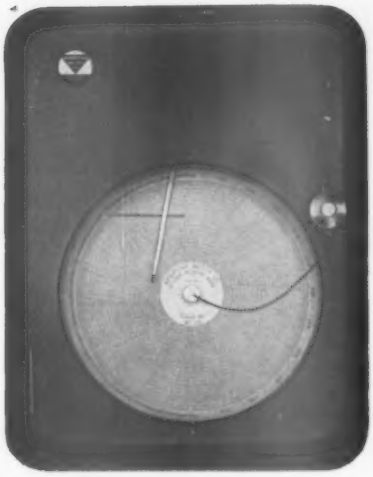
Frac-Shot is used primarily for "tailing-in" conventional fracturing treatments. Sand is used first, and then Frac-Shot is added to occupy 25% of the radius nearest the well bore.

Although Frac-Shot costs somewhat more than sand, the additional expense is quickly offset by the great increase in production of fractured wells. And, on very deep wells, Frac-Shot may actually cost less than an all-sand fracture, due to the great amount of sand required.

Get Full Details

Frac-Shot is available from all major service companies. For full imformation and free brochure on Frac-Shot, contact the people who know aluminum *and* aluminum for petroleum use—your local Reynolds office. Or write: *Reynolds Metals Company, P. O. Box 2346-CR, Richmond 18, Virginia.*

Watch Reynolds TV show "Harrigan & Son", Fridays; also "All Star Golf", Saturdays —ABC-TV.



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all other side effect measurements are of questionable significance.

I am distinctly shocked by the extreme poverty of the data presented in Mr. Miller's radiation-intensity maps. The contrasts between high and low values are almost nonexistent. Based on this data, it would appear that the development of radioactivity surveys is at a state roughly equivalent to that of geochemical surveys about 1937.

Martin J. Davidson
President
Davidson Geochemical Oil Co.
Houston

It was thought-provoking

Dear Sir:

Congratulations to The Oil and Gas Journal for publication of a thought-provoking article—"Radiation Surveys **Can** Find Oil," by George H. Miller (OGJ, Feb. 13, p. 124). The proof Mr. Miller offers certainly warrants the scrutiny of explorationists.

Even though we are not in agreement with Mr. Miller as regards his preference of instrumentation, field techniques, or cost analysis, we are certainly heartened that a recognized geologist will publish his true evaluation of this exploration technique.

More and more responsible exploration supervisors are recognizing the value of radioactivity surveying in their integrated search for oil. Perhaps this is in part due to the Journal's policy of bringing such subjects to the attention of the industry.

William D. Crews
President
Exploration Unlimited, Inc.
Tulsa.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

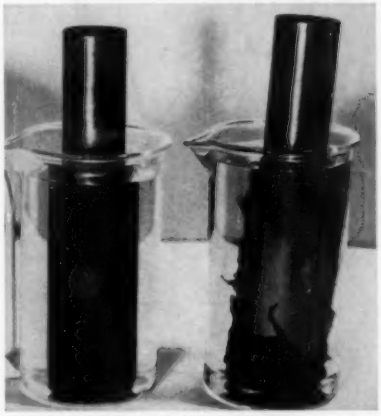
MARCH

5-9 American Society of Mechanical Engineers, gas-turbine power division, and U. S. Department of Defense, annual gas-turbine conference and products show, Shoreham Hotel, Washington.

7 Petroleum Equipment Suppliers Association, Pacific district meeting, Ambassador Hotel, Los Angeles.

7-8 University of Oklahoma, School of

here's how Depban works to stop paraffin troubles before they start



This photograph shows how Depban* paraffin inhibitor works.

Both steel cylinders were given a coating of paraffin similar to that which occurs under actual well conditions.

There was one difference, however. The cylinder on the right had been treated previously with Depban.

This photograph was taken just 25 seconds after both cylinders were immersed in tap water at room temperature. Notice that paraffin on the cylinder treated with Depban is falling off rapidly while paraffin on the untreated cylinder is unaffected.

For full details on this revolutionary new way to control paraffin problems, call your Dowell representative. *DOWELL TRADEMARK

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There's a *right* tool for every job. In foam control it's Dow Corning silicone antifoamers or defoamers . . . job-proved thousands of times over as the most efficient, most economical, and most versatile foam suppressors available.

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Geological Engineering, seventh biennial geological symposium, Student Union Building, University of Oklahoma, Norman.

8-9 API Committee on Public Affairs, Chicago regional conference on employe communications, Sheraton-Towers Hotel, Chicago.

8-10 American Petroleum Institute, Division of Production, southern district meeting, Captain Shreve and Washington-Youree hotels, Shreveport, La.

13-16 Kentucky Petroleum Marketers Association, sixth management institute, conducted by the University of Louisville, Brown Hotel, Louisville.

13-17 National Association of Corrosion Engineers, annual meeting and corrosion show, Hotel Statler, Buffalo, N. Y.

15-17 Natural Gasoline Association of America, annual convention, Baker Hotel, Dallas.

16-17 International Oil and Gas Educational Center, study of the economics of petroleum exploration, development, and property valuation, Southwestern Legal Center, Dallas.

20 American Gas Association, general management section conference, Francis Marion Hotel, Charleston, S. C.

21-23 American Power Conference, twenty-third meeting, Sherman Hotel, Chicago.

21-30 American Chemical Society, 139th annual meeting, Kiel Auditorium, St. Louis.

22 American Institute of Chemical Engineers, Chicago section, symposium on new developments for chemical processing and new developments for the engineer and management, Conrad Hilton Hotel, Chicago.

22-24 American Petroleum Institute, Division of Production, southwestern district meeting, Cole Hotel, Albuquerque.

23 National Industrial Conference Board, general session, Shamrock-Hilton Hotel, Houston.

23-24 North Texas Oil and Gas Association, annual meeting, Kemp Hotel, Wichita Falls, Tex.

27-28 University of Wichita, School of Engineering, third annual production institute, university campus, Wichita.

28 Canadian Petroleum Association, annual general meeting, Hotel Palliser, Calgary.

27-29 Midwest Gas Association, annual meeting and convention, Sheraton-Fontenelle Hotel, Omaha.

27-29 Society of Petroleum Engineers of AIME, Saudi Arabia section, regional meeting, Dhahran, Saudi Arabia.

27-31 Instrument Society of America, symposium on temperature measurement and control in science and industry, Veterans Memorial Auditorium, Columbus, Ohio.

28-29 University of Oklahoma, Schools of Petroleum and Gas Engineering, gas conditioning short course, Oklahoma Memorial Union Building, University of Oklahoma, Norman.

APRIL

4 Instrument Society of America, New Jersey section, annual symposium on electronic process instrumentation, Hotel Essex House, Newark, N. J.

4-5 University of Kansas, gas compressor Institute, Liberal, Kans.

5-6 Third annual symposium on pilot plant and process automation, Ambassador Hotel, Los Angeles.

5-7 American Petroleum Institute, Divi-

ANOTHER NEW ACHIEVEMENT IN MODERN FLOW CONTROL BY CRANE

1 Single retaining nut holds cartridge assembly in body, for fast, foolproof dismantling and assembly

2 Teflon* thrust washer reduces stem friction; absorbs line pressure load on ball

3 Teflon* seats pre-loaded for tight shut-off with minimum torque

4 Bright plastic grip insulates handle and flags valve position

5 Positive, Standard Size O-ring seals on stem, cartridge

6 Self-aligning, precision-machined ball, polished and chrome-plated to minimize friction and wear on seats.

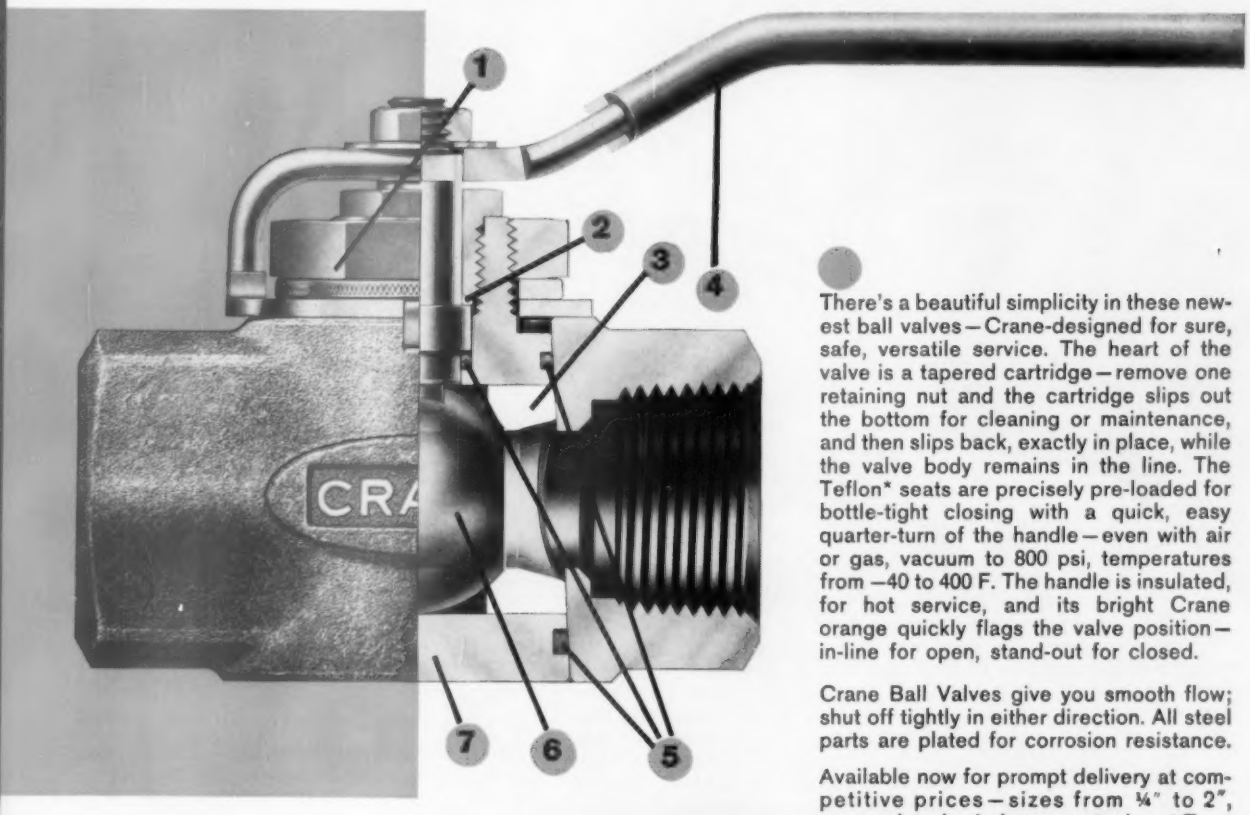
7 Tapered cartridge contains all working parts; slips out bottom in one piece for cleaning or maintenance

* Teflon is a registered trademark of E.I. DuPont de Nemours & Co., Inc.

CRANE BALL VALVES

with the exclusive tapered cartridge that drops out for fast, in-line servicing

designed to handle hydrocarbons and aromatics to 400 F



There's a beautiful simplicity in these newest ball valves—Crane-designed for sure, safe, versatile service. The heart of the valve is a tapered cartridge—remove one retaining nut and the cartridge slips out the bottom for cleaning or maintenance, and then slips back, exactly in place, while the valve body remains in the line. The Teflon* seats are precisely pre-loaded for bottle-tight closing with a quick, easy quarter-turn of the handle—even with air or gas, vacuum to 800 psi, temperatures from —40 to 400 F. The handle is insulated, for hot service, and its bright Crane orange quickly flags the valve position—in-line for open, stand-out for closed.

Crane Ball Valves give you smooth flow; shut off tightly in either direction. All steel parts are plated for corrosion resistance.

Available now for prompt delivery at competitive prices—sizes from ¼" to 2", screwed ends, in bronze, steel and Type 316 stainless.

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CHEMICAL
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sion of Production, Mid-Continent district meeting, Mayo Hotel, Tulsa.

6-7 University of Oklahoma, School of Mechanical Engineering, short course on industrial engines, University of Oklahoma, Norman.

6-8 Texas Oil Jobbers Association, Petroleum Marketers Association, convention and trade show, Baker Hotel, Dallas.

8-12 Petroleum Equipment Suppliers Association, annual meeting, The Greenbrier, White Sulphur Springs, W. Va.

10-11 American Society of Mechanical Engineers, maintenance and plant engineering conference, Bancroft Hotel, Worcester, Mass.

10-12 Western Petroleum Refiners Association, annual meeting, Granada Hotel, San Antonio, Tex.

10-13 American Society of Mechanical Engineers, oil and gas power conference and exhibit, Jung Hotel, New Orleans.

11-13 Petroleum Industry Electrical Association and Petroleum Electric Supply Association, annual conference, Moody Convention Center, Galveston, Tex.

12-14 Investment Bankers Association of America, annual convention of the Texas group, Shamrock Hilton Hotel, Houston.

17-19 Instrument Society of America, symposium on instrumental methods of analysis, Shamrock-Hilton Hotel, Houston.

18-20 University of Oklahoma, southwestern gas measurement short course, North Campus, University of Oklahoma, Norman.

19-20 University of Tulsa, fifteenth annual conference of accountants, University campus, Tulsa.

19-20 National Petroleum Association, semiannual meeting, Hotel Sheraton-Cleveland, Cleveland.

20-21 Society of Petroleum Engineers of AIME, East Texas-Louisiana-Arkansas gas-technology symposium, Tyler, Tex.

20-21 Texas Technological College, annual West Texas oil lifting short course, Lubbock, Tex.

20-22 Illinois Society of Professional Engineers, annual convention, Peoria, Ill.

24-26 Southern Gas Association, meeting, New Orleans.

24-27 American Association of Petroleum Geologists, Society of Economic Paleontologists, and Rocky Mountain section of AAPG, annual meeting, Denver Hilton Hotel, Denver.

26-28 American Petroleum Institute, Division of Transportation, pipeline conference, Chase-Park Plaza Hotel, St. Louis.

27-28 Rocky Mountain Oil and Gas Association, midyear meeting, Northern Hotel, Billings, Mont.

28 Natural Gasoline Association of America, Oklahoma regional meeting, Lake Murray Lodge, Ardmore, Okla.

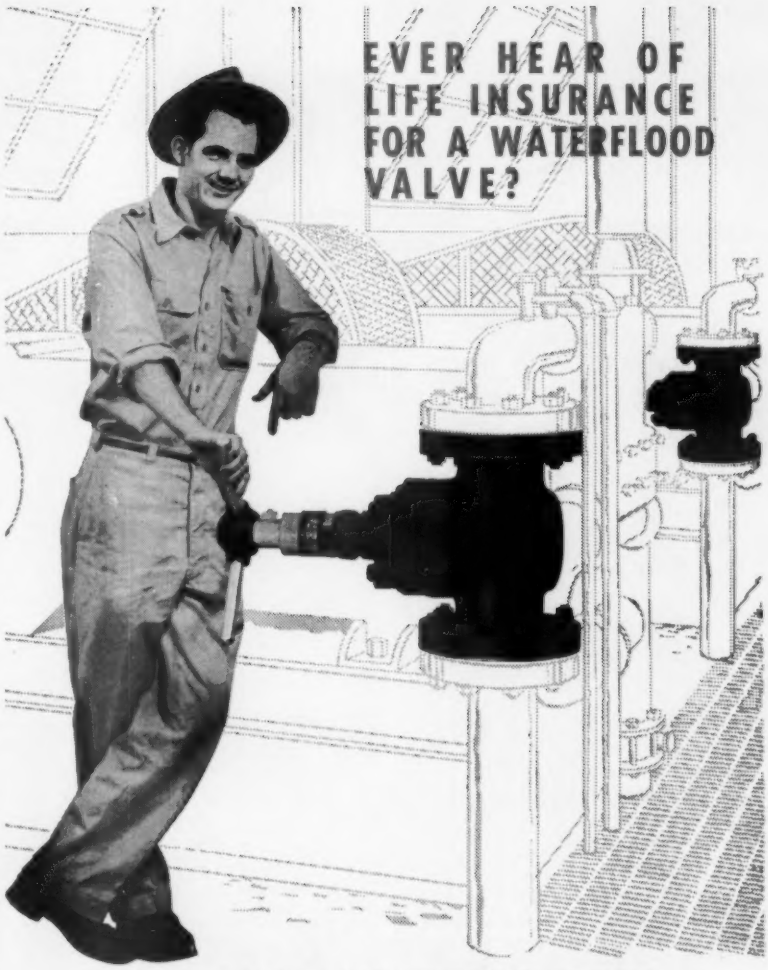
29 American Institute of Chemical Engineers, Oklahoma state meeting, University of Tulsa, Tulsa.

30-May 2 Independent Petroleum Association of America, midyear meeting, Roosevelt Hotel, New Orleans.

30-May 3 Liquefied Petroleum Gas Association, convention and trade show, Conrad Hilton Hotel, Chicago.

MAY

2-4 Purdue University, School of Civil



Maybe not—but you *get* it, automatically, when you specify the Demco Valve for waterflood operations! Because Demco's unique design and construction give you *built-in insurance* for longer, troublefree valve life against the highly-corrosive qualities of salt waterflooding. With Demco's high-pressure gate valve, you get a positive rubber-to-metal seal—tough synthetic rubber against corrosion-resistant stainless, Monel, aluminum bronze or ductile iron.

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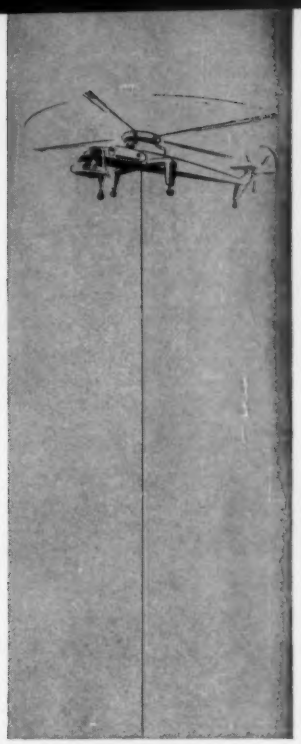
THIS IS A STRICK-TAINER. Loaded, locked, and sealed from origin to destination, it eliminates costly multiple handling of cargo. It can be removed from a truck to a freight car and then removed again for transport to the hold of a ship. The Strick-Tainer not only reduces handling costs but nearly eliminates all loss by damage and pilferage too. It also reduces insurance premiums, and allows cargo to go through in a fraction of the time.



AND WHEN A SIKORSKY SKYCRANE MOVES A STRICK-TAINER from rail or truck to a waiting ship in the bay, or from ship to land, this cargo container becomes the most modern transfer system in the world. Transferring the container easily and quickly by the Skycrane eliminates expensive hoisting equipment—tugboat, docking, and labor fees. Loading time is reduced to a minimum, and productive sailing time increased substantially.

WHAT CAN THIS NEWEST SIKORSKY SKYCRANE LIFT FOR YOU? Now in production, new twin-turbine S-64's will lift and carry up to 10 tons easily as a breeze. And the load can take any shape at all: transmission towers, poles, heavy drilling or construction equipment, tools, drums, parts, vehicles, even a small bridge. The new Skycranes will also carry such detachable pods as: field offices, medical units, tool sheds, kitchens, passenger conveyances, or anything else you might need. A Sikorsky representative will be glad to give you all the details. Why not write today?

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Stratford, Connecticut

THE FLOW RECORDER YOU CAN COUNT ON

Absolute dependability, under the most demanding operating environments—that's the promise and the performance of the Barton 202A flow recorder. Thoroughly proven in the gas production fields, the 202A is enjoying ever-increasing popularity in gas transmission and distribution systems. It is compact and ruggedly built, not subject to the usual frailties of such a precise instrument; it has built-in overrange protection, which allows it to maintain calibration under wide pressure fluctuations; it is immune to condensate problems, making it ideal for application in all geographical areas. A recently added bonus: the 202A can be fitted with the new Barton chart changer which allows the instrument to record continuously and unattended, for up to 16 days, using a fresh chart each day. For complete information and specifications on the 202A flow recorder, request Bulletin 202A-1.

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Engineering, sixteenth industrial-waste conference, Purdue Memorial Center, Lafayette, La.

3-5 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone-Henning Hotel, Casper, Wyo.

4-5 Society of Petroleum Engineers of AIME, oil recovery conference, Midland, Tex.

4-5 Pacific Coast Gas Association, Inc., transmission conference, Biltmore Hotel, Santa Barbara, Calif.

7-10 American Institute of Chemical Engineers meeting, Sheraton-Cleveland Hotel, Cleveland.

8-11 American Petroleum Institute, Division of Refining, midyear meeting, Rice Hotel, Houston.

9-11 Western Joint Computer Conference and Exhibit, Ambassador Hotel, Los Angeles.

10-12 American Society of Mechanical Engineers, production engineering conference, Royal York Hotel, Toronto.

10-12 Canadian Institute of Mining and Metallurgy, oil and gas division, and Calgary and Edmonton petroleum engineering sections of Canadian Institute of Mining and Metallurgy and American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, McDonald Hotel, Edmonton, Alta.

11-12 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

11-12 Texas A. & M. College, thirteenth oil recovery conference, College Station, Tex.

12 Natural Gasoline Association of America, Permian basin regional meeting, Lincoln Hotel, Odessa, Tex.

14-17 Texas Independent Producers and Royalty Owners Association, Scharbauer Hotel, Midland, Tex.

16-19 American Petroleum Institute, Division of Marketing, midyear meeting, Americana Hotel, Miami Beach.

17-19 Western Petroleum Refiners Association, Mid-Continent regional technical-industrial relations meeting, Hotel Lassen, Wichita.

19 Natural Gasoline Association of America, Permian Basin regional meeting, Lincoln Hotel, Odessa, Tex.

21-24 American Petroleum Institute, Division of Transportation, midyear highway conference, Bellevue Stratford Hotel, Philadelphia.

24-25 Western Petroleum Refiners Association, computer conference, Ben Franklin Hotel, Philadelphia.

25 Pennsylvania Grade Crude Oil Association, annual meeting, Pennhills Club, Bradford, Pa.

25-26 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual Rocky Mountain petroleum sections, joint meeting, Salt Lake City.

JUNE

1-2 Kentucky Oil and Gas Association, annual meeting, Phoenix Hotel, Lexington.

5-6 Petroleum Electric Power Association, meeting, Mayo Hotel, Tulsa.

6-8 Instrument Society of America, summer instrument-automation conference and exhibit, Royal York Hotel and Queen Elizabeth Hall, Toronto.

6-8 Sixth annual Appalachian underground corrosion short course, West Virginia University, School of Mines, Morgantown, W. Va.

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Pave the way to pay dirt fast with Security bits! Today, Security offers over 1150 sizes and types, designed to fit every drilling need. Security FIRSTS are built into every bit. Exclusive gas heat treating techniques assure maximum quality metal control. All-new, electronic equipment controls and checks bearings to microscopic-fraction accuracy. New Extended Jet bits give closer-to-bottom cleaning action with added penetrating speed. Exclusive nail-locks for jet bit nozzles make old-fashioned snap rings obsolete!

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SIOUX Air Impact Wrenches deliver up to 15% more torque while consuming 30% less air!

SIOUX Electric Impact Wrenches such as the No. 330 illustrated, deliver the extra measure of efficiency, performance and freedom from trouble you expect from SIOUX.

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WHEN IT'S A SIOUX YOU KNOW WHAT IT WILL DO— SIOUX tells you the torque your air or electric impact wrench will deliver. Don't buy just a wrench. Buy certified SIOUX power!

The No. 270 SIOUX Slugger is an all purpose metal working tool. It cuts metal, breaks spot welds, splits nuts, shears bolts, punches out pins, and scrapes metal clean.

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TEX TUBE THE LITTLE MILL WITH THE BIG IDEAS!

JOURNALLY SPEAKING

50 years ago

March 9, 1911

One of the largest plants ever to be built for making gasoline from casing-head gas is being put in by Rodinaffer Oil & Gas Co. in the deep sand territory of Fairfield County, Ohio. It will have a capacity for compressing 400 M.c.f.d. of gas.

President Taft evidently has decided to give conservation cranks full sway. He has appointed one of their most ardent boosters to be Secretary of the Interior. We may now expect orders restricting oil withdrawals covering every acre of government land, and then some. Oklahoma producers, however, have had so much trouble in the past they are virtually immune to letting this scare them.

The Cherokee district, comprising the Bartlesville and Nowata-Chelsea areas, tops all Oklahoma fields in oil activity. It has 216 of the state's 312 new wells completed the past month. It furnished 10,223 of the 23,408 bbl. of new production added.

25 years ago

March 5, 1936

Unparalleled drilling activity is sweeping North Louisiana and southern Arkansas in the wake of the booming development of the big, prolific Rodessa field. Completion of 11 more good wells gives Rodessa field the best week since its discovery last July.

Canadian oil men form Canadian Petroleum Institute at Calgary meeting with Sam G. Coultis as first president.

Pure Oil Co. reveals plans for $1,500,000 expansion and remodeling project at its Smiths Bluff, Tex., plant, near Nederland, south of Beaumont. Crude capacity of plant to be increased from 30,000 to 50,000 bbl. daily.

10 years ago

March 8, 1951

George Vasen's 1 Tung Oil Co. wildcat in Stone County, Mississippi, tries to blow out while drilling at 20,300 ft., and may become world's deepest producer. (Editor's note: It didn't.)

New deep gas discovery by R. J. Caraway in northeastern Val Verde County, in far-southwestern Texas, opens first commercial production (Vinegarone field) in county. Discovery well, 1 Guida Rose, flows 3,120 M.c.f.d. of gas on drill-stem test, from Strawn (Pennsylvanian) formation. Location is 50 miles from nearest deep production in West Texas.

Northern Natural Gas Co. launches $60,000,000 pipeline expansion program involving laying of more than 580 miles of pipe in Kansas, Oklahoma, Nebraska, and Texas.

Refining Ostriches

SOME U. S. REFINERS are acting like ostriches. The seem to think that if they stick their heads in the sand nobody will notice them and they won't see any trouble.

The most recent evidence of this—though a minor one—is a change in the form of the press release the API issues on its weekly figures on refining activity.

There is nothing wrong with this. A moving average deemphasizes an occasional freak peak week which might give rise to a scare headline. But if one purpose of the additional figure is to keep the rest of the oil industry from paying so much attention to refinery runs, we predict it will be futile.

These days the entire industry is watching runs and stocks like a hawk because these figures are the key to the prosperity of the whole oil business.

A moving average is a useful figure to show a trend, but it doesn't hide the trend any more than an ostrich is hidden when his head is in the sand.

The Oil and Gas Journal has been computing a 4-week moving average of refinery runs for many years. It's in a chart in our statistics section, along with the actual weekly figures from API. This week it's on Page 210. Take a look, and note that even after week-to-week fluctuations are ironed out the average is still high.

Refiners also seem to have their heads in the sand when it comes to watching for danger signs in the industry's statistics and forecasts. They just can't seem to see that turning out more refined products than consumers will use is going to breed trouble for everybody in the business.

Another symptom of the ostrich psychology is the way some refiners consider their run figures to be a deep-dyed corporate secret—though a great many others freely give their figures to anybody anytime.

The ostriches don't realize that there are very few real secrets in the oil business any more, and that their competitors have various ways of making pretty accurate guesses as to what they are doing and that these reports circulate through the grapevine of trade gossip.

Last summer, at the repeated urging of a great many of our readers, the Journal made a vigorous campaign to get all U. S. refiners to let us print their individual runs.

Practically all the smaller refiners and a majority of the larger ones agreed. But a number refused. And some of them insisted that their runs are highly confidential.

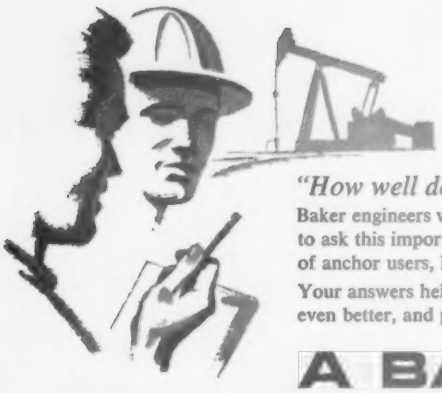
So, as a partial substitute, we began collecting and printing the monthly run figures by refineries as filed with the conservation bodies of five southwestern states. The data had been on the public records for years but nobody had bothered to publish them. January's figures are on Page 92 of this issue.

Now the Texas Railroad Commission is issuing reports on the runs of companies who buy Texas crude, and this adds more enlightenment (see Editorial, Page 73).

But the funniest thing was that one major company tried to discover the "leak" through which we were getting runs of its Texas plants, but admitted that we probably wouldn't disclose our source. We didn't. We just didn't have the heart to tell the man that his own company had been reporting the figures to Austin every month for 20 years and that anybody could see them on the public record.

There's no use trying to reason with an ostrich.

—*Henry D. Ralph*



"How well does it work?"

Baker engineers went out into the field to ask this important question of dozens of anchor users, large and small.

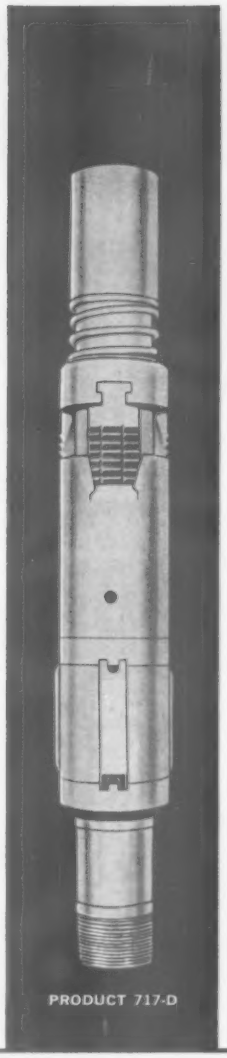
Your answers helped us to make a good tool even better, and proved again that . . .

A BAKER COMPENSATING TUBING ANCHOR

Reduces Rod and Tubing Wear as evidenced by the need for fewer pulling jobs.

Increases Pumping Efficiency as measured in more barrels of oil, reduced pumping speeds or lower power consumption.

Really Does Compensate as indicated by the need to respace pumps after several days use, or by the upstrain required to release doughnut-type hangers—or, most importantly, by the results obtained.



PRODUCT 717-D

The Baker Compensating Tubing Anchor has been on the market a little over three years. It has proved its ability in hundreds of wells and recent changes make it even better.

Because it automatically compensates for changing well conditions, it maintains the right amount of tension at all times to effectively eliminate breathing and buckling. It's easy to run—no involved calculations, no need to apply tension from the surface.

A careful study of hundreds of field reports reveals not one reported instance of inability to retrieve a Baker Compensating Anchor where the casing above the anchor was in good condition and to gauge. And recent design improvements now insure easier removal with greater freedom from corrosion.

The economics of today's oil industry make it more important than ever to explore every possible means of cutting costs and improving efficiency. Baker honestly believes that the Compensating Tubing Anchor is one such means. Your Baker Man has the facts on this tool's past performance, and on the several ways it has been improved. Ask him.

TYPICAL FIELD REPORTS

Kansas: Operator ran anchor in an attempt to cut down tubing leaks (seven leaks in previous three months). In the twelve-month period following installation of a Baker Compensating Tubing Anchor he has had only two tubing leaks and has increased pump efficiency by approximately 43%.

Texas: Operator had run twenty-five Baker Compensating Tubing Anchors and was very pleased with results. As a test, he released the Baker anchor in a well that was making 140 barrels per day. After release (tubing string unanchored) he reported that production fell off to 75 barrels per day. After resetting anchor, production went back to 140 barrels per day.

Eastern Colorado: Operator has run 40 Baker Compensating Anchors. Had not previously used anchors. Ran anchors to reduce frequency of tubing jobs to replace rod-cut tubing. Reported that he had eliminated rod-cut tubing, increased pump life 100% and production 14%.

BAKER BAKER

BAKER OIL TOOLS, INC. HOUSTON • LOS ANGELES • NEW YORK

Two dozen men could cure the runs problem

ONCE AGAIN refinery runs are so high that the whole industry is concerned that the resulting excess stocks will bring on price wars and destroy the profit possibilities for everybody.

This time, thanks to figures on some companies' runs now being obtained by the Texas Railroad Commission, it is possible to draw a prima facie conclusion as to which ones are chiefly responsible for the high runs.

IN JANUARY U. S. runs averaged 8,325,000 bbl. per day, or 83.91% of the API figure of operable capacity. Of the companies buying crude in Texas, 16 operated at higher than this average capacity—3 medium-sized companies and 13 majors each refining more than 100,000 bbl. daily.

These 13 majors have 60.5% of U. S. capacity and operated at an average of 89.8% in January to process 64.8% of total U. S. runs. All the other 156 refining companies operated at an average of 74.8% of capacity.

There are other companies, large and small, not reporting to Texas and whose runs are unknown. Many small ones may be running at even closer to maximum capacity. But it is a reasonable conclusion that about two dozen of the largest companies are the primary cause of the high national runs and stock figures.

Why these companies run so much crude is difficult to answer. Each doubtless would say that its runs and stocks are the minimum needed for its own markets—and there is no way of disproving such a statement.

But each has statisticians familiar with demand forecasts, stock totals, and consumption trends. Heating-oil demand was somewhat higher than forecast, but not enough to require such high runs. And there was no need whatever for all the extra gasoline produced.

A probable explanation is that the majors used to buy products from smaller refiners to meet peak demands but now they make it all themselves. This leaves some smalls with a surplus even though they've cut runs. If they have to dump at distress prices they will get blamed for ruining the market.

WHATEVER THE CAUSE, something should be done immediately and it appears that the majors are the only ones in position to do much. Future trouble is piling up fast. February runs were higher than January—nearly 8,400,000 bbl. daily. Last year the peak of the heating season came in March but that freak isn't likely to be repeated.

Most of the No. 2 being refined today won't be burned in the 1960-61 season. The gasoline made this quarter won't be used until midsummer. Refiners will have to pay storage on it and also cut their second-quarter runs way down. Or else dump the surplus at giveaway prices—and there goes the whole industry's 1961 earnings prospect.

We suspect the root of the trouble is poor management by the heads of a couple of dozen big refining companies. The industry looks to them for leadership and what does it get? More surplus stocks of oil.

COMPUTER ANALYSIS SHOWS TEL ROAD BONUS, TOO

$$\text{ROAD ON} = a + b\,(R) + c\,(M) + d\,(O) + e\,(TEL)$$

CONTINUING study and analysis of modern fuel performance requires periodic updating of the familiar road octane prediction equations to maintain the best accuracy. It is now clear that a TEL factor must be added to the usual Research, Motor and hydrocarbon terms in order to predict a Road octane number that closely approximates the real thing.

In fact, results of recent tests indicate that the TEL coefficient can be the single most important compositional factor in computing a fuel's Road octane number accurately.

Here's the Equation

In its present form, the equation includes all four factors affecting road performance.

$$RON = a + b(R) + c(M) + d(O) + e(T)$$

where R = Research octane number
M = Motor octane number
O = Olefins in percent by volume
T = Milliliters of tetraethyllead/gal.

In other words, if two fuels have the same Research and Motor octane number and the same olefin content, the one higher in TEL has the higher Road octane number.

Compare the Coefficients

Recently Ethyl rated the road performance of 32 full-boiling, commercial premium gasolines in four cars. This is how the equation worked out:

$$\text{Road octane number} = 25.70 + 0.353(R) + 0.391(M) - 0.089(O) + 0.466(T)$$

In this series of tests, the TEL coefficient ranged from 0.354 to 0.484, depending on engine speed.

The TEL Road Bonus

If the TEL coefficient is 0.4, then increasing the TEL concentration from 2.0 to 4.0 ml/gal. gives a road bonus of 0.8 octane numbers [(0.4 x 4) − (0.4 x 2)]. This Road octane increase is a bonus over and above the increase in Research and Motor octanes due to added TEL.

In some cases the road bonus from TEL can amount to more than one whole octane number per milliliter of added TEL.

REMINDERS TO REFINERS

Antiknocks are your best octane improvement buy, whether costs are figured on Research, Motor or Road ratings.

Antiknocks give you a Road octane bonus you can't get any other way.

Gasoline sensitivity can be decreased with antiknocks.

Refining flexibility can be increased with antiknocks.

Antiknocks also can reduce or delay capital investment in octane improvement equipment.

ETHYL CORPORATION, NEW YORK • TULSA • CHICAGO • HOUSTON • LOS ANGELES
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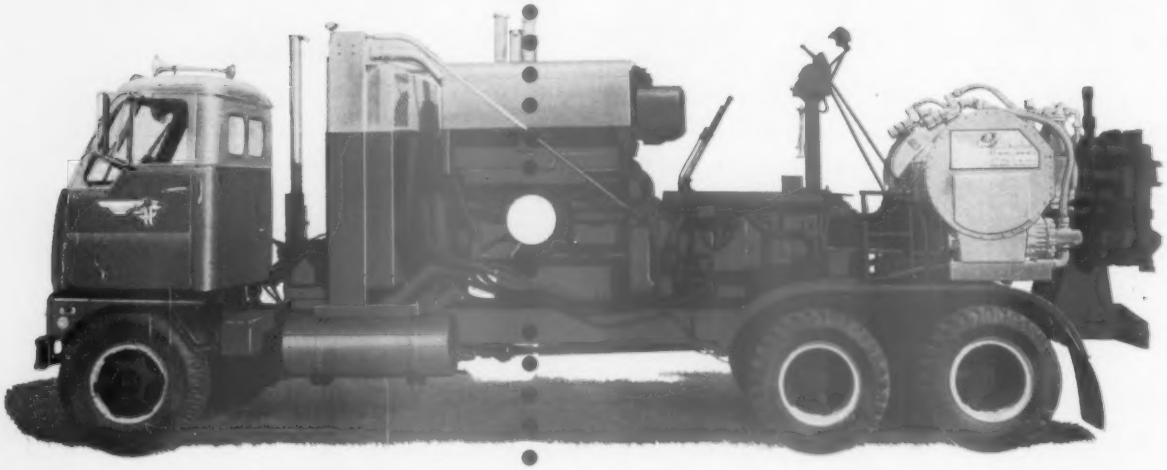
ETHYL ANTIKNOCK COMPOUND ETHYL CORPORATION

DIESEL DOES IT!



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SAFE, DEPENDABLE DIESEL POWER

... is used to drive the pumps on all Halliburton Fracturing Trucks. Why Diesel?

- **It has unquestioned dependability in oilfield service.**
- **No electrical ignition is required.**
- **Exhaust temperatures are lower ... safer!**
- **Low volatile fuels are used.**

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... offers exactly what you need ... large or small ... to handle all types of treating fluids ... to proportion additives and to perform under difficult pumping conditions. Whatever the needs of your well, choose from Halliburton's large variety of fracturing units, proportioners and other equipment to improve performance on your next fracturing job.

"STILL FIRST — WITH THE FINEST ... IN FRACTURING"

Put the advanced design of Halliburton Fracturing Equipment to work for you with these basic techniques:

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Government Moves Deeper Into Oil

● Each week sees new Washington developments affecting oil. Last week's moves: A call for keeping the 4-cent gasoline tax, new steps toward a fuels policy study, an appeal for state regulation of natural-gas liquids.

THE FEDERAL Government became more deeply involved in the oil industry last week with these rapid-fire developments:

. . . **Retention of present 4-cent gasoline tax** for years to come was asked by President Kennedy, who faces a real fight over the issue.

. . . **Any move involving residual oil imports** will strive to balance all interests, the President told the press.

. . . **A fuels-policy study** is winning favor in Congress, but the big question is which house will do the work.

. . . **FPC tipped its hand** on how it will conduct this week's gas-pricing hearing at Midland, Tex. Aim of the sessions will be to air conflicting views on what kind of information is needed to establish area gas prices (see p. 81).

. . . **State control over gas-liquids production was** urged by Oil Import Administrator Lawrence J. O'Connor.

. . . **Resignation of Capt. Matthew V. Carson** as director of the Office of Oil and Gas was disclosed. No successor has been named.

Highway fight . . . Kennedy's gasoline-tax proposals have set off a storm, and signs indicate he faces a rocky fight to win his requests.

The President in a special message to Congress says he wants the federal gasoline tax continued at 4 cents a gallon to keep the federal highway construction program on a pay-as-you-go basis.

He also asks that use taxes on trucks be raised to bring in $300 million more a year. This is equivalent to another half-cent a gallon on gasoline.

Kennedy says that if the truck taxes are not raised Congress should increase the gasoline levy to 4.5 cents. The present 4-cent gasoline tax is due to drop automatically to 3 cents July 1.

His tax proposals for truckers involve: Diesel fuel to go from 4 to 7 cents a gallon; use tax on trucks over 26,000 lb. to go from $1.50 per thousand pounds to $5; tax on highway tires to go from 8 to 10 cents per lb.; tax on inner tubes to go from 9 to 10 cents per lb.; and tax on tread rubber to go from 3 to 10 cents per lb.

Kennedy estimates that nearly all the truck taxes would fall heaviest on trucks that use diesel fuel and weigh more than 26,000 lb. when loaded. He adds that even then heavy trucks would not bear their fair share of the highway costs.

Necessity for the added taxes, Kennedy explains, is a desperate need for an extra $900 million a year through 1972 to complete the interstate highway system on schedule. He calls the program essential to national defense, highway safety, and to help revive the economy.

The 1-cent added gasoline tax produces about $600 million. The truck levies or a half-cent jump in gasoline taxes would provide the remaining $300 million.

Both the trucking and oil industries are up in arms against the proposals and plan to air their views March 14 when the proposals are given a hearing before the House ways and means committee.

API President Frank M. Porter declares the American motorist today is bearing a tax burden beyond his proper share. He adds that the 4-cent rate is unjustified as long as another $1.7 billion in highway-user excise taxes are diverted each year to non-highway use. He says Congress should keep faith with the motorists who were promised a drop in the tax to 3 cents.

The American Automobile Association also favors a drop in the tax to 3 cents but supports Kennedy's request for sharper curbs on highway billboard advertising.

Residual imports . . . The President promises to attempt an almost impossible task in any decision he makes on retaining or dropping the residual import program.

He will try to balance all interests.

"We have to consider the needs of the coal industry, of domestic producers, and of New England and we are trying to reach a balance which will protect the public interest," he told his press conference.

This promise cheers coal-state senators who stepped up their pressure on the White House to retain residual curbs. But New England consumers also are hammering away at critical shortages stemming from the program.

As the time nears for a decision on residual, here's the action now favored by top Interior Department officials:

. . . **Continue residual curbs** but allow all the imports actually needed by consumers.

. . . **Discard changes** proposed by former Secretary Fred A. Seaton concerning division of quotas.

. . . **Promise a full study** looking

Carson Resigns From Interior Post

CAPT. Matthew V. Carson, Jr., a key figure in government oil matters since 1957, has resigned from the Department of the Interior.

The resignation will be effective April 1.

Carson has been director of Interior's Office of Oil and Gas since April 1, 1958.

No successor has been named. Interior Secretary Stewart L. Udall last week said he plans to appoint an acting director to serve while he makes a "diligent search for a highly competent man" to be the director.

Carson also has resigned from the Navy. He plans to travel and then may set up a law office. He holds a law degree from the University of Texas.

Carson joined Interior July 29, 1957 as administrator of the voluntary oil import program. He became the first oil import administrator in March 1959 when the program was made mandatory by the White House. He played a key role in shaping that program.

For a time Carson wore two hats as director of OOG and as oil-import administrator.

On July 1, 1960 Lawrence J. O'Connor became oil-import administrator, a post he still holds.

Capt. M. V. Carson
. . . Out of uniform, too.

Udall has not said whether he plans to keep O'Connor or to replace him.

As director of OOG, Carson also was chairman of the Foreign Petroleum Supply Committee in 1958 during the Lebanon crisis, co-chairman of the National Petroleum Council, and petroleum adviser to the U. S. mission to NATO.

He joined the Navy in 1940 and served in four major campaigns in the South Pacific, where he commanded destroyer escorts.

---

to a fairer division of quotas among persons with a history of imports, with terminal inputs, and with historic markets.

Who'll study . . . Congress is moving toward a committee study of the national fuels picture but there's some confusion over whether the House or Senate will do the job.

The House rules committee has voted out a resolution for a 15-member House committee to make the study. House action on the measure is still pending.

The committee would make "a full and complete investigation of the current and prospective fuel and energy resources of the United States." Aim would be to determine what changes may be advisable to provide an effective national fuels policy.

Sen. Jennings Randolph (D.-W. Va.), author of a measure before the Senate interior committee, now is considering pressing for a Senate committee to make the study. His measure at present calls for a joint House-Senate study.

Liquids problem . . . The peril of unregulated natural-gas liquids production has been brought home to the oil industry by the new imports boss.

Speaking to the Society of Petroleum Engineers, AIME, at St. Louis, O'Connor says gas liquids are a major cause of crude producers' problems.

Natural gas and associated liquids are cutting into traditional markets for crude oil and are leading to increased pressure to reduce crude-oil imports.

"Essentially, the control of such liquids lies with the states themselves, and at this juncture, we can only urge that vigorous and forthright action be taken to relate these liquids to over-all market demand for unrefined petroleum," he says.

O'Connor reports that output of the liquids last year was 639,000 bbl. daily, a gain of 62% since 1954. This is about 90% of controlled crude oil imports into Districts 1-4.

Calling the liquids "one of the more pressing problems of the future," he warns that their production "will probably increase at a rate more rapid than over-all petroleum demand."

O'Connor predicts that gas liquids will continue to take up the slack created by lower imports and the situation will be aggravated by the rise of uncontrolled imports from Canada.

Turning to residual-oil imports, O'Connor calls the present program "intolerable" except on a short-run basis. He objects that it freezes the market, denies a place to new importers, and may lead to questionable trade practices, such as tie-in sales.

"An alternate procedure to the current historic approach must eventually be developed," he warns.

Midland approach . . . The FPC apparently is ready to launch an extensive cost-fact finding study of the gas industry.

This is the conclusion drawn from three questionnaires drafted by FPC in advance of the area pricing conference at Midland, Tex.

The questionnaires are proposed for discussion purposes only, but they indicate the kind of information the FPC feels it needs to handle area pricing on a fair basis.

The information adds up to a top-to-bottom insight into the finances of each oil and gas producer. Among the data sought: Latest financial report plus full description of sources and cost of money capital of the producer; full statistics pertaining to production and exploration operations; and the same for gas gathering and products extraction.

If March Isn't Cold, Look Out!

• High runs are shooting up stocks, and there's little hope that demand will equal today's refinery-output rate.

THE general product-stocks picture has darkened considerably in the last 2 weeks, and the industry could be in deep trouble unless refinery runs drop sharply over the next 4 weeks.

Here is the trend:

Since February 24, stocks of the four major products have increased 1,745,000 bbl. In same period last year they dropped 7,380,000 bbl.—a difference of 9,125,000 bbl.

From a different view, products stocks 2 weeks ago were down 15,974,000 bbl. from the same week last year. The total now shows these stocks down only 6,894,000 bbl.

Looking ahead, this is the prediction: Within 3 weeks, these stocks will start running ahead of last year.

The tipoff lies in last year's March weather. That made demand heavy then. But refiners also that month held down runs to 7,854,000 bbl. daily for a 3-week period. The result was a reduction of nearly 25,000,000 bbl. in stocks.

This year, however, refiners for the last 5 weeks have averaged running 8,385,000 bbl. of crude daily. Despite these high runs, product-stock reductions followed a nearly normal seasonal pattern for the first 3 weeks of the period. The sudden change came 2 weeks ago, and it will get worse rapidly.

Weather even colder than last March will be needed to use up products from refinery runs averaging 8,400,000 bbl. daily. Refiners certainly can't depend on that kind of weather.

Average March reduction in four-product stocks for recent years has been about 6,000,000 bbl. That decline of 25,000,000 bbl. last March was unusual and was due to two factors: High demand from abnormally cold weather and moderate refinery runs.

Since refiners can't do much about the weather, what they do to curb runs in weeks ahead becomes a paramount concern of the whole oil industry. Excessive product inventories inevitably mean lower prices all along the line—and lower profits.

First Refrigerated LPG Tanker Being Built

THE Japanese are building the world's first refrigerated tanker to move liquefied petroleum gases from Kuwait to Japan.

The LPG will be used in the petrochemical industry and for domestic consumption as bottled gas.

Conch International Methane, Ltd., which designed and developed the "Methane Pioneer," the original liquid methane carrier, has designed the Japanese vessel.

Bridgestone Liquefied Petroleum Gas Co., a Japanese company, will own the LPG ship now under construction by Mitsubishi Nippon Heavy Industries (Yokohama), Ltd., a Japanese shipyard.

The ship will have a capacity of 180,000 bbl., which is equivalent to about 17,000 tons of refrigerated LPG at about −40° F. Service speed will be 16 knots.

Last week's announcement of the Japanese plans was made in Houston by Continental Oil Co., a 40% owner of Conch. The Royal Dutch-Shell Group also owns 40% and Union Stock Yard & Transit Co., Chicago, owns 20%.

British Petroleum Co. is expected to furnish the Kuwait gas liquids.

The Bridgestone tanker will be completed early in 1962. Continental said that Bridgestone will distribute the refrigerated LPG "for petrochemicals and domestic use such as bottled gas."

Japan showed an early interest in liquid methane, as well as LPG, and one of Bridgestone's representatives traveled on the maiden voyage of the "Methane Pioneer" in 1959 from Lake Charles, La., to Canvey Island in the Thames River near London. The ship made seven trial voyages.

Others interested . . . Several companies have been looking at the economics of refrigerated tanker movement of LPG.

By eliminating the need for pressure vessels, refrigeration makes it possible to use square tanks instead of round. This adds at least 25% to the capacity of a tanker, compared with a ship using pressure storage.

There also is a saving in steel, although the saving in weight is no great advantage. LPG is much lighter than crude, for example, and can be loaded in greater volume.

One deterrent to widespread use of refrigeration on sea-going LPG vessels is the fact that a large market is required to make use of big tankers practical.

Make Your Own Drilling Forecast

EVERY oil man can now be a forecaster. Farther back in the Journal are the tools needed for a do-it-yourself projection of 1961 rig activity.

Journal Economist John Casper found in working with the industry's figures that the pattern set in early months can be projected, using a little witchcraft based soundly on historical occurrence to a pretty accurate year-end total.

In this week's issue, Casper starts a chart for your 1961 forecast and provides a table of past performance. Using these, plus the weekly drilling figures appearing in the Journal's statistical section, you can predict 1961's record long before it's official.

For your own do-it-yourself kit, turn to page 205.

New Thermal Process Makes Cheaper Benzene

• Method converts toluene to benzene at less cost than catalytic processes and can also produce naphthalene from catalytic cracking cycle stocks.

GROWING markets for benzene and naphthalene have spurred a search by refiners for new methods of extracting these materials from refining streams.

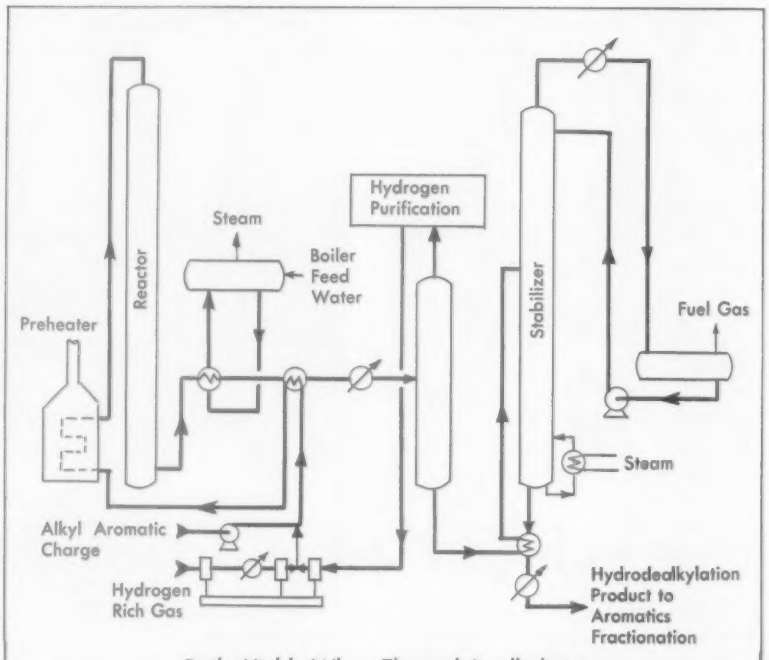
The newest to be announced is a thermal method for dealkylating with hydrogen.

The process gives high yields of benzene from toluene, xylenes, and other feedstocks. It also can produce naphthalene, using catalytic cracking cycle stocks and other refinery streams.

The thermal method is the development of Atlantic Refining Co. and Hydrocarbon Research, Inc. They call it HDA.

Other companies are believed to have thermal methods, or have them under development.

Thermal hydrodealkylation is not new. The chemical reactions involved are well known. But because of high temperatures, speed of reaction, and need for a method of controlling the exothermic reaction, this process has not been used in commercial plants. Catalytic methods have been used in existing benzene and naphthalene plants.



Daily Yields When Thermal Dealkylating

Toluene to Benzene		Light Cycle Stock to Naphthalene	
Charge		**Charge**	
Toluene, bbl.	1,000	Light cat cycle stock 400-500° F. cut	1,300
Products		**Products**	
Methane, M.s.c.f	1,260	Methane, M.s.c.f.	2,100
Ethane, M.s.c.f.	19.2	Ethane, M.s.c.f.	820
Propane, M.s.c.f.	10.5	Propane, M.s.c.f.	350
Butanes-Pentanes, bbl.	8	Butanes, bbl.	17
Benzene, bbl.	820	C_5-plus gasoline, bbl.	250
Heavy aromatics, bbl.*	2.6	Naphthalene, lb.	137,000+
		Fuel oil, bbl.	12
Chemical H_2 consumption		Chemical H_2 consumption	
M.s.c.f.	1,390	M.s.c.f.	2,500
s.c.f. per bbl. of product	1,390	s.c.f. per bbl. of product	1,900

*Triphenyl and anthracene. +Equals 50 million pounds per year.

Thermal dealkylating . . . Atlantic started its search for a thermal method in 1952. In 1957 Hydrocarbon Research joined in the development. A 5-bbl. pilot plant built at its Trenton, N. J., laboratory confirmed that high yields of benzene and naphthalene could be produced by thermal dealkylation.

Other features of the process:

. . . Feedstocks for benzene production may be toluene, xylenes, ethyl benzene, or thermal gasoline. When used for naphthalene production, cat cracking cycle stocks, heavy reformate, or thermal cracking polymers can be used.

. . . Operating conditions include reactor temperatures in excess of 1,200° F. and pressures ranging from 500 psig. upward. Whether hydrogen is purified and recycled, or is burned as fuel depends upon the availability and purity of reformer hydrogen.

. . . Chemical hydrogen consumption in benzene production is about 1,400 cu. ft. per barrel of toluene charge. It increases to about 1,900 cu. ft. per barrel when naphthalene is produced from light cycle stock.

. . . Yields of benzene and naphthalene are in the range of 96 to 98% of the theoretical. Typical yields, based on pilot-plant work, are given in the table.

As shown in the table a 400° to 500° F. cycle oil cut results in a 34% (wt.) yield of naphthalene and a better than 20% yield of highly aromatic gasoline. Based on a 1,000 bbl. charge of toluene, 820 bbl. of benzene can be recovered.

In addition to the higher conversions offered by the thermal process, other advantages claimed are:

. . . Lower plant costs are possible because the thermal process operates continuously at high efficiency and smaller plants can be constructed to obtain a yield equal to that of a larger catalytic plant.

. . . Catalyst costs and losses are eliminated.

. . . Hydrogen consumption is low. Minimum reformer hydrogen is required since there are no periodic drops in conversion efficiency.

Key factor in the success of the

Atlantic-Hydrocarbon process is the design of the reactor.

Better balance needed . . . Almost all petroleum benzene is extracted directly from refinery streams rich in aromatic components. The benzene is accompanied by toluene and xylenes, which can be separated later, in proportions similar to those in the stream.

However, there isn't much of a market for toluene and about two-thirds of it is blended into gasolines as a high-octane component. But benzene is in good demand as a feedstock for synthetic rubber, plastics, phenolic resins, and detergents.

This marketing situation makes the conversion of toluene to benzene attractive.

Xylenes can also be readily converted to benzene but the current price structure doesn't make this step economically feasible.

Current spot prices for benzene are about 34 cents per gallon, or approximately 9 cents above toluene. But xylenes sell for only 4 to 7 cents below benzene.

Other processes . . . Most widely used method for converting toluene to benzene is Universal Oil Products Co.'s Hydeal process, a catalytic hydrodealkylation process. Units now operating, under construction or planned, have a capacity of more than 100 million gallons annually.

Last month Houdry Process Corp. announced "Detol," also a fixed catalyst bed process. First unit, with a capacity of 17 million gallons annually, is now under construction at the Houston refinery of Crown Central Petroleum Corp.

Among the other companies which have announced plans for new toluene dealkylating facilities is Humble Oil & Refining Co. Its 25 million gallon per year plant will go on stream early in 1962.

Humble has not revealed whether the company-developed process to be used is catalytic or thermal. Some of its competitors suspect the latter.

Total capacity of these toluene-to-benzene plants will be about 200 million gallons annually when all announced projects are completed. Based on an 80% benzene yield, they would absorb some 250 million gallons of toluene.

Petro-naphthalene growth . . . Inability of the coke and coal-tar industries to keep pace with naphthalene demand has resulted in a construction program by oil companies which will add 325 million pounds annual capacity. All are taking the catalytic route.

The 75 million-pound plant Ashland Oil & Refining Co. just completed at Catlettsburg, Ky., uses the Hydeal process.

Sun Oil Co. will use a catalytic method it developed for its 100 million-pound Toledo, Ohio, plant. The Tidewater-Collier plant at Delaware City, Del., and the 50 million-pound plant Monsanto Chemical Co. has announced for Alvin, Tex., will also use catalytic methods developed by the individual companies. Tidewater and Collier also plan to build a 50 million-pound plant in the Los Angeles area.

Area Pricing Will Pack Midland Hearing

- **Ground rules for future hearings will be the target of this first session—and a big audience is expected.**

CONFLICTING views on what type of information is needed to determine area prices for natural gas will be aired at the Federal Power Commission's prehearing conference on Permian basin prices opening in Midland March 6.

The town will be swarming with producers, attorneys, state officials, association representatives, and gas experts of various stripes. More than 300 parties have had themselves listed as direct participants, and some 60 more have petitioned to intervene.

This won't be a hearing to take evidence about Permian prices. It is a conference to determine how to hold the hearing—what sort of evidence is pertinent, how the evidence should be presented, and how to give each affected party his day in court without running the hearing from now till Doomsday.

What to expect . . . FPC has already tipped its hand on its thinking.

It has mailed out three enormous questionnaires asking complete disclosure of the most intimate and minor details of the operations of every producer, large or small. At Midland it will ask producers what they think of it.

The answer will come from a committee of attorneys of company members of the Mid-Continent Oil and Gas Association. It will be that much of the information requested is irrelevant to the price of gas and that no useful purpose will be served by compiling such a mass of data.

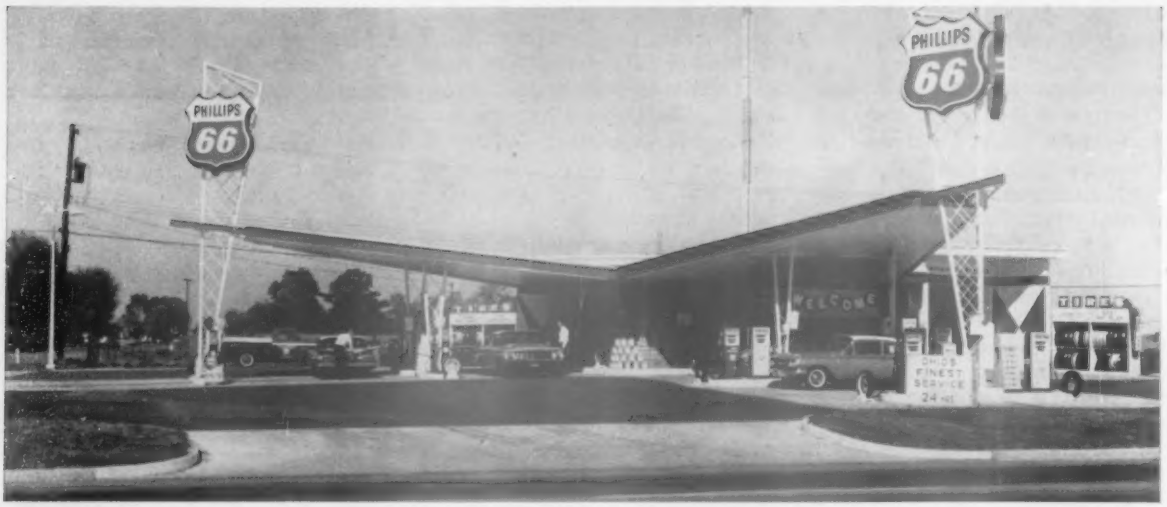
Then the committee will unveil a plan of procedure it has been hammering out for many weeks. It will suggest the type of evidence it thinks FPC needs, the most expeditious way of compiling and getting it into the record, and ground rules for keeping the hearing as short and orderly as practical.

The FPC questionnaires suggest that the commission is inclined to lean heavily on cost data—perhaps not exactly the sort of individual-company cost data that would go into a rate base, but quite similar information from every producer in the Permian basin so as to get a complete and industry-wide average. for its use.

The producers' attorneys will offer as an alternative a method for getting representative key figures from a cross-section of the industry.

In addition to the type of information to be submitted, a thorny problem is how to present it. Every producer and every consumer will be affected by the outcome and has a constitutional right to be heard. But obviously FPC can't let each of several hundred parties put on all the witnesses he wants and then let each party cross-examine each witness as long as he cares to.

Efforts will be made to agree on methods for group presentation, stipulating material, limiting intervenors, shortening examination of witnesses, and otherwise keeping the hearing orderly and to the point.



NEW DESIGN will be used for Phillips Petroleum service stations in the Baltimore sales-division area.

Phillips Plunges Into East Coast Markets

• Besides moving the 66 flag into a five-state area under the jurisdiction of a new Baltimore sales division, the company has made a deal with Pennsylvania's Aero Oil—one of the biggest independent jobbers in the country.

THE EXPECTED marketing invasion of Mid-Atlantic states by Phillips Petroleum Co. was formally begun last week with the opening of a Baltimore sales division office.

The new office will carry the Phillips 66 flag into Maryland, Delaware, the District of Columbia, northern Virginia, eastern Pennsylvania, and southern New Jersey—a 5-billion-gallon annual motor fuel market.

Thus Phillips, the nation's eighth largest oil company, will be selling branded products in 40 states and the District of Columbia through more than 21,000 outlets.

The move leaves the Phillips brand without representation in only New York, New England, and California in the continental United States.

The drive into the northeast is being directed by George Glatfelder, senior assistant sales manager who joined Phillips in 1931 as a service-station operator in Bartlesville, Okla., the company headquarters.

Heading up the Baltimore division will be N. W. (Dan) O'Haver, who has been in the company's marketing organization since 1932. He got this new assignment on the basis of his recent success, as manager of the Raleigh, N. C., sales division.

Jobber campaign opens . . . Phillips got into business in the Mid-Atlantic states by signing a 10-year contract with Aero Oil Co., New Oxford, Pa., reportedly the largest representative of Atlantic Refining Co.

The deal aligns Phillips with one of the nation's largest independent jobbers. Aero does more than 54 million gallons of gasoline and heating-oil business annually. The connection with Aero will enable Phillips to start selling products through almost 200 stations in a 9-county area of Pennsylvania and Maryland on April 1.

Phillips, with a brand strange to this region, competed with 15 other marketers for the Aero alliance. Aero's president, M. D. (Dave) De Tar, decided to end his 15-year relationship with Atlantic as of March 31.

Atlantic had been trying for years to purchase the distributorship, according to De Tar, a founder and former president of the Pennsylvania Petroleum Association. He said he preferred to continue as an independent.

Phillips is out to make similar deals to expand its northeastern coverage. This is in line with a policy under which 85% of total company products sales are made through independent jobbers and dealers.

Phillips is already a marketer of LPG in Mid-Atlantic states and a major supplier of fuel oil in the New York Harbor area.

It will supply the new market primarily by tanker from Phillips' Sweeny, Tex., refinery, using terminal factilities at Baltimore. The company also is negotiating to build terminals on pipelines where product exchanges can be worked out.

Push eastward . . . The Mid-Atlantic sales campaign takes on greater significance when viewed in light of Phillips' recent southeastern efforts.

The eastward push began in Florida in August 1953 with the establishment of a sales division headquarters at Tampa. A marine terminal was built there and by the start of 1954 products were being sold through 200 outlets. Now the company is Florida's third-ranking seller of petroleum products.

In 1954 southeastern sales were extended to Alabama, Georgia, the Carolinas, and Virginia. In the first year outlets increased to more than 450. Construction was started or announced on five pipeline terminals and five more marine terminals to serve this area.

In 1958 Phillips started selling automotive products in Ohio, where it had been a distributor of LPG for 31 years.

The foothold in Ohio was gained through the war-built Little Big Inch pipeline, which was converted from natural gas to products that year. The 20-in. line extends from the Houston area, where it is connected to the Sweeny refinery, to Lebanon, Ohio, where Phillips leases terminal facilities.

In 1959 a division sales office was opened in Columbus. Now there are more than 30 jobbers and 200 retail outlets handling Phillips 66 products in Ohio. More than 100 additional stations are under construction.

The Ohio invasion coincided with adoption of "the bright new look" for all Phillips' stations. This involved new color combination, new signs, and new packaging. Most of last year was required to make the new appearance company-wide.

Two new "key stop" terminals will increase the company's product supply in the state. These automated terminals enable a truck driver to load without a terminal attendant. One was completed last November at Aurora and another is nearing completion at Columbus.

Phillips has been a leader in these automatic loading terminals. The company's first such facilities were built at Pasadena, Tex., and Arcadia, La. They result in lower loading costs.

New York next? . . . If the expansion pattern persists, it seems only a matter of time until motorists in New York and New England will become acquainted with the Phillips 66 sign.

Already the nation's leader in natural-gas liquids production, natural-gas sales, and production and marketing of liquefied petroleum gases, Phillips is steadily boosting its ranking as a seller of refined products. It may soon be able to claim status as a truly national marketer.

watching WASHINGTON

Clyde La Motte

• Why did producers jump into resid control fight? . . .

FROM this observation post it appears that producer groups made a mistake by getting involved in the current hassle over the residual-fuel-oil import-control program.

No other segment of the oil industry defended the program at the recent hearing held by the Interior Department.

The line of reasoning by producer spokesmen was this:

Any action that tends to weaken resid prices, such as an increase in the flow of residual fuel imports, puts a squeeze on the total product realization by refiners. This, producers reason, would inevitably depress the price for domestic crude. The end result: The producer would have less income to plow back into finding and producing oil. So the nation's security would be endangered.

This is a winding path of logic. For instance, it seems strange—if the domestic refiner's position is endangered—that domestic refiners didn't appear at the recent hearing to warn against a relaxation of residual fuel controls. But they didn't. So why did producers feel obliged to plead their case for them?

Also, producer spokesmen would be hard put to cite a time when the fluctuation of resid prices caused crude-oil prices generally to rise or fall.

Let us face it: Many factors affect the price of domestic crude. But if the price of resid is one of these factors, it is so minor it has never made itself very apparent.

• Crude program is strong enough to stand alone . . .

THE OTHER reason for the producer stand was the fear that any crack in the oil-import program would tend to endanger crude import controls.

That, too, is shaky logic. It puts the producers in the exposed position of defending controls for control's sake.

This isn't necessary. Producers have a logical basis for defending the crude import program. Thus it would seem to be poor tactics for them to wander away from such a strong position and expose themselves to the political crossfire of the residual fuel controversy.

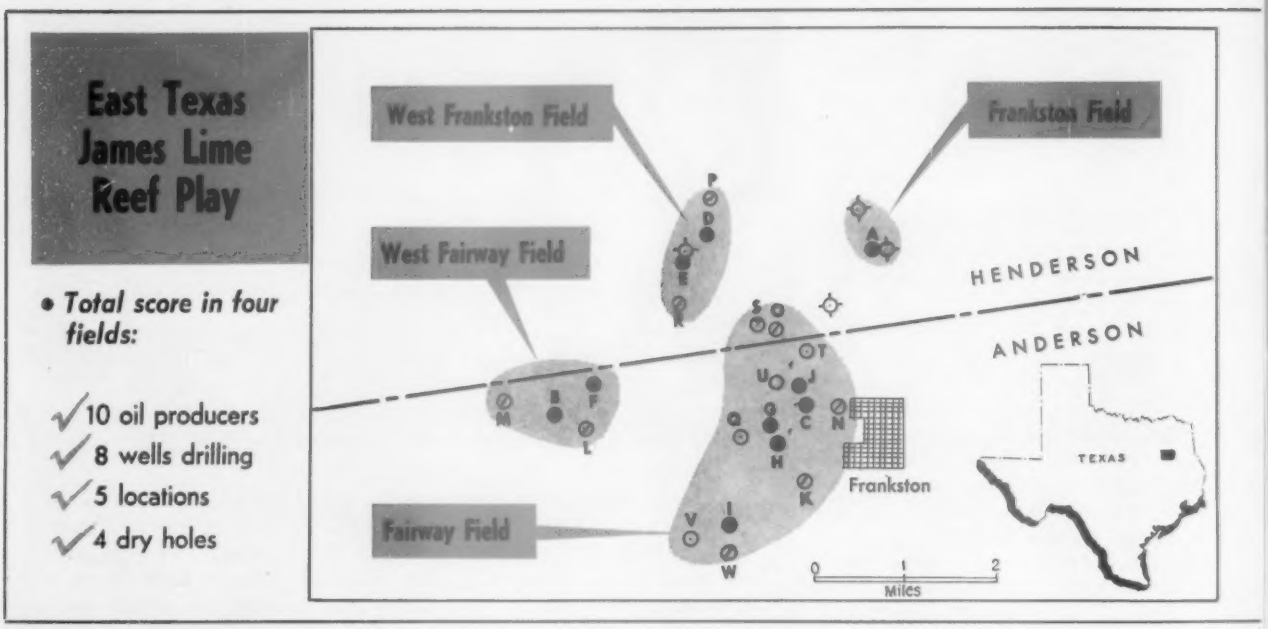
• A step toward end-use control of natural gas . . .

EVEN from a totally self-interest standpoint, producers should take a second look at their defense of the resid program.

It should be obvious that the coal industry cannot be content with resid restrictions alone. Unless natural gas use is also restricted, gas will move more and more into New England industrial markets.

You may be sure that coal is aware of this and will press hard for government action to limit natural gas use. That would certainly have a direct impact on domestic producers, for they are the ones who supply the natural gas.

It would seem that producers would be reluctant to help set the stage for such a development.



James Lime Reef Is Best East Texas Find

Neil Williams
Associate Editor

IT LOOKS as if a major oil field is shaping up in the James lime reef play near the East Texas town of Frankston.

Operators call it the most significant James lime production found so far.

It is the most important find in East Texas since Neches, which was discovered in 1953.

The new producing area already has 10 good wells. Eight wells are drilling. Locations have been staked for five more.

The reef development resembles that of some of the prolific Pennsylvanian reefs of West Central Texas.

It may kick off a flurry of exploration in the region, which lies in southeastern Henderson County and northeastern Anderson County (OGJ, Dec. 12, 1960, p. 173).

At a recent Texas Railroad Commission hearing, operators revealed they will push for rapid development. They want to get an idea of productive limits as soon as possible.

Fairway Operating Co., biggest operator in the area, expects to drill at least 30 additional wells this year. And other operators have plans to drill at least 20 more wells.

Field's history . . . The reef play has been going full blast for only 6 months or so. But it was foreshadowed by a discovery that goes back more than 5 years.

The first pool in the area, Frankston field, was opened by Cities Service Oil Co. in March 1955. The discovery, about 2 miles northeast of Frankston in southeastern Henderson County, remains the only well in Frankston field.

After a dry hole was drilled near this discovery, interest in the area waned and stayed dormant until last year.

Now the development area spans Frankston field and three related pools which may tie into a single large field. Wells are spread over 4 sq. miles.

The new fields are West Frankston, Fairway, and West Fairway.

Current activity . . . Five of the current producers are in Fairway field. Fairway Operating Co. has four of these and is drilling three more wells. The fifth producer in this field was drilled by Frankel Brothers.

Fairway Operating Co. has two more producers in West Fairway field and two rigs running there. And the company has two producers in the recently opened West Frankston field.

Four other operators have entered the play. Sun Oil Co. has started drilling a well in the West Frankston sector. Gulf Oil Corp. and Jack Frost have made locations for a well each in the main Fairway pool. And Claud B. Hamil is drilling a well in the latter field.

How play developed . . . Fairway Operating Co. started its discovery well, 1 Wofford, in Fairway field as an extension of Cities Service Oil's one-well Frankston field. The Fairway field is in northeastern Anderson County, about ¾ mile northwest of the town of Frankston. Frankston field is 2 miles northeast of Frankston in southeastern Henderson County.

Since the discovery well's completion in July, a dry hole has been drilled about midway between it and the Cities Service well.

West Fairway field was opened by Fairway Operating Co.'s second test, 1 Maymon, drilled as a 2-mile west stepout from the discovery well in the Fairway field. Another

James Reef Wells

A Cities Service 1 White (Discovery)
B Fairway Operating 1 Maymon (Discovery)
C Fairway 1 Wofford (Discovery)
D Fairway 1-B Lupkin (Discovery)
E Fairway 1-A Lupkin
F Fairway 1 Miller-Hurt
G Fairway 1 Moore
H Fairway 1 Westbrook
I Fairway 1 Wilkerson
J Frankel Brothers, 1 Henley
K Fairway 1-B Westbrook
L Fairway 1 Eva Hurt
M Fairway 1 Douglas-Langford
N Fairway 1 Scarbrough
O Fairway 1 Stevenson
P Sun Oil 1 Lloyd
Q Fairway 1 Billingsley
R Fairway 1-D Lupkin
S Gulf 1 Westbrook
T Fairway 1 Abbot
U Jack Frost 1 Howell
V Fairway 1 W. H. Stevens
W Claud B. Hamil 1 Bessie Cook

in 8 Years

well recently has been completed.

Well characteristics . . . Most of the wells completed so far have shown relatively high initial flowing rates. All have been capable of producing much more than the discovery allowable of 200 bbl. daily.

The smallest well flowed 217 bbl. daily through 12/64-in. choke. Several of the wells have had daily flows above 400 bbl. through chokes of that size.

Oil flows have been with gas-oil ratios from 1,000 to 1,400 cu. ft. per barrel, and flowing pressures 2,000 to 2,500 psi. Gravity of the oil is 47° to 49° API.

Producing depths of the James lime in the three areas range from 9,800 to 10,100 ft., with all wells drilled to depths below 10,000 ft. Net oil pay runs from 21 to 59 ft.

James lime, a lower member of the Glen Rose formation of the Lower Cretaceous age, long has been recognized as potentially productive in East Texas.

Last month the Texas Railroad Commission set field rules for Fairway field which included 80-acre spacing with allowable basis of 50% on well and 50% on acreage, and an allowable of 220 bbl. daily.

California Gas Needs Cited

• Utility lawyer argues that approval of both the TGT Mexican pipeline and Rock Springs line may be required.

NATURAL-GAS DEMAND in California is growing so fast that maybe regulatory authorities should approve both the proposed Texas-Mexico-California pipeline and a rival project.

That argument was made last week before the California Public Utilities Commission by R. E. Woodbury, general counsel for Southern California Edison Co.

Tennessee Gas Transmission Co. wants to build a line to move Texas and Mexican gas to Edison's steam-generating plants in southern California.

Opposing forces would move Texas and Oklahoma gas to California and the Rockies. This project envisions a 155-mile, 34-in. line from Rock Springs, Wyo., to Provo, Utah, where it would join a proposed 395-mile line to the California-Utah border.

Woodbury appeared at hearings where the commission was considering the Rock Springs project, which is backed by Pacific Lighting Gas Supply Co., El Paso Natural Gas Co., and Colorado Interstate Gas Co.

Only preliminary hearings have been held on the Mexican line, while the Rock Springs project has received conditional approval. Last week's hearings were held to review the Rock Springs conditions, which the three sponsoring gas companies claim they have met satisfactorily.

In contrast to Woodbury's views, W. M. Jacobs, president of Pacific Lighting, has declared he doesn't see how the commission can justify approval of both lines. His company is fighting the line through Mexico since it would be built to serve Pacific Lighting's biggest customer, Edison.

A decision may be reached on the Rock Springs line before any definite action is taken on Edison's proposal for approval of both lines. However, Woodbury urged the commission not to pre-judge the Edison suggestion until all evidence has been heard.

Woodbury pointed out there is no "compelling or emergency justification" for approving the Rock Springs line before completing hearings on the Mexican line.

Poll Shows Most Geophysicists Working

APPARENTLY most geophysicists still have full-time jobs, despite a 50% cutback in the number of crews working in the U. S. and Canada.

The Society of Exploration Geophysicists has produced this clue from a poll of its 5,700 members.

Only 66 out of 3,900 who answered the society's questionnaire said they were hunting a job.

The survey shows 3,605 members are employed. Eighteen are students, 85 are consultants, and 53 aren't seeking work.

Results of the job poll, the first ever made by SEG, were disclosed last week by Colin Campbell, business manager of the organization. He addressed the Canadian section of the society in Calgary.

Campbell said trained geophysicists haven't been stranded by low activity in their field because employers and oil companies absorbed many of them in other pursuits. A number of geophysicists have moved into management posts.

Most of the unemployed geophysicists turned up by the survey have less than 5 years experience.

The poll gives no indication of what has happened to hundreds of drillers, shooters, surveyors, and helpers who once worked in geophysical parties. The SEG assumes they have been hit hardest by unemployment, and Campbell added that "these are the people who will be hard to find" when geophysical work picks up again.

Questionnaire replies came from 3,121 SEG members in the U. S., 358 in Canada, 125 in Latin America, and nearly 300 in the Eastern Hemisphere.

New Mud Services Make Driller's Job Easier

• Reconditioned or tailor-made liquid mud, supplied by chain of plants in Texas and Louisiana, can save drilling time and sizable chunks of cash.

A GROWING CHAIN of facilities across the Texas and Louisiana Gulf Coast is helping drillers get the kind of mud they want in a hurry and at lower cost.

At key spots in an area where perhaps two-thirds of the domestic industry's mud is used, two leading mud companies have established nearly a score of storage and mixing units for liquid mud.

Buildup of the facilities has mushroomed over a period of less than 2 years. Up to half a dozen more units are planned.

The companies offering the service are Magnet Cove Barium Corp. (Magcobar), and Baroid Division of National Lead Co. Both companies can provide reconditioned or custom-made liquid muds quickly.

The service goes far beyond that which has traditionally been offered by truckers who move used mud from one location to another.

"What we have now is a method for furnishing complete mud services to the driller," a Baroid spokesman says.

Premixed liquid mud can save drillers the time required for breakover or conversion from one type of mud to another during operations. Usually muds are mixed at the wellsite directly into the mud stream, with considerable loss of drilling time.

NEWLY COMPLETED liquid-mud and bulk-mud facilities of Baroid Division, National Lead Co., at Edinburg, Tex., are part of a chain of similar plants in Texas and Louisiana.

The units . . . Both Baroid and Magcobar have invested heavily in facilities for the liquid-mud service.

Magcobar has units at Lake Charles, Rayne, Intracoastal City, Berwick, Houma, and Empire along the Louisiana Gulf Coast and at Ruston in North Louisiana.

This month it put into operation a new installation at Edinburg, Tex., and it plans three more for Texas.

Baroid has units at Houma, Monroe, Lake Charles, and Intracoastal City in Louisiana, and at Liberty, Hebbronville, Alice, Beeville, Port Lavaca, and Alvin in Texas. It also has others planned.

Magcobar last week described its new facility at Edinburg, which is typical of many of the installations. The plant has six 500-bbl. storage tanks and one 250-bbl. mixing tank. It has two 6-in. centrifugal pumps to move the liquid mud between the storage and mixing tanks.

Two 70-bbl. pneumatic tandem trailers deliver mud from the unit to

SPECIAL BARGES are used by Magcobar to deliver liquid mud to inland water locations in South Louisiana.

locations in the area. Truck loading takes 3½ minutes.

The muds . . . Magcobar says it can provide premixed new liquid muds from nearby warehouse stocks of dry muds. But most of the muds handled at its liquid-mud facilities have been salvaged from drilling wells and reconditioned.

The salvaged mud is picked up at the drilling site. At the plant it is pumped into the mixing tank and tested for such properties as weight and viscosity. Most muds require reconditioning before being pumped into storage.

Inventories of muds of various specifications are kept in tanks. They are pumped back into the mixing tank and conditioned before delivery.

Baroid offers similar service for reconditioned muds, but emphasizes the advantage to the driller of using custom-made muds for many specialty jobs.

How it helps . . . Quick liquid-mud service in the field has many advantages.

It makes possible replacement of lost muds without delay and at less cost. The same applies to killing wells with heavily weighted muds available at the storage sites.

Workover operators can use liquid muds handily because the muds can be mixed to specifications in small amounts.

Drillers moving from one location to another can have mud from the old well reconditioned and transferred to the new one.

When a driller is finished with the mud, he can sell it to the service company.

Because of the variety of factors involved, figures on savings are hard to pin down. Savings might vary from 10% to 75%, depending on such things as weight of the mud, amount of reconditioning and new materials required, amount of drilling time saved, and general convenience of the service.

Certainly in such emergencies as a blowout, the saving of perhaps 8 hours required to mix a mud would be considerable.

Transportation . . . Baroid and Magcobar can deliver liquid muds by truck to land locations or by barge to inland waters and offshore.

Magcobar's new tandem-trailer can discharge a full load pneumatically into mud-storage pits in 3 minutes. Using a vacuum pump, it can pick up 70 bbl. of mud from the rig in 7 minutes. Portable compressors are used for loading and unloading 55-bbl. skid-mounted tanks.

The company has five tugs, eight liquid-mud barges, and a 120-ft. offshore cargo vessel for Louisiana water operations. The barge pumps deliver mud at 18 bbl. per minute.

Texas Court Tough on Saline Pollution

THE Texas Supreme Court has lowered the boom on oil operators in two separate pollution cases.

The decisions, say some oil lawyers, constitute a new interpretation of the law governing pollution in the state.

Both cases involved pollution of landowners' fresh-water supplies by salt-water seepage from surface pits. The court held that, even though the operators had surface leases from the landowners to dig and use the pits, the operators were negligent and that they must pay damages.

In one case, the heirs of Charles Lundell brought suit against James G. Brown & Associates for pollution of an irrigation well during oil operations in Lubbock County. The Supreme Court affirmed lower-court decisions holding Brown liable.

In a second case, the higher court reversed an appeals court and upheld a district court judgment giving Edwin Aiken $37,070 for pollution damage resulting from a well drilled by General Crude Oil Co.

INDUSTRY BRIEFS . . .

A second liquidating payment of of $7 a share has been made to stockholders of Monterey Oil Co., which was sold to Humble Oil & Refining in January. The payment was the result of the sale of 15% of Transwestern Pipeline and a share in Parcel D, a block off Santa Barbara County, California. Northern Natural bought the pipeline interest and Texaco the offshore property. An original liquidating payment of $34 was made, and a final payment of $1 is expected later this year.

The Louisiana allowable of 1,015,531 bbl. daily for March tops the million mark for the first time, and exceeds the January-February level by 18,414 bbl. However, the Louisiana Conservation Commission figures net crude-oil production will be 983,531 bbl. daily.

Oklahoma's March allowable of 19 bbl. daily is the highest in 13 months. The Oklahoma Corporation Commission says the new allowable will produce about 535,000 bbl. daily, compared with about 520,000 bbl. in February under a 17-bbl. rate.

A natural gasoline plant is being built near Shreveport for Texas Natural Gas Corp. The low-temperature absorption plant will have a capacity of 150 million cubic feet of gas daily. Liquids production will approximate 125,000 gal. daily. Gas supply for the plant will come from wells located within Barksdale Air Force Base. Completion is expected about July 1.

A new pricing policy for gasoline sales has been put into effect for Iowa jobbers by Phillips Petroleum. The state is divided into 22 zones and Phillips is posting a competitive delivered price in each zone. A company spokesman says this does not mean Phillips is withdrawing price protection.

Merger plans of Reed Roller Bit Co. and Dresser Industries have been dropped. A group of Reed minority stockholders objecting to the merger bought stock to increase their holdings to more than 20%. The merger plan required 80% stockholder approval. The merger would have involved an exchange of 7 shares of Dresser stock for 10 of Reed.

"Grand Old Man" Passes 100

ONE of the petroleum industry's most celebrated individuals, Godfrey L. Cabot, last week celebrated his 100th birthday.

Cabot entered the industry in 1882—79 years ago—as a chemist. Only a year later he planned his first "sut plant" to make carbon black. Over the years, the operation grew into Godfrey L. Cabot, Inc., major world producer of carbon black.

Cabot is shown at right at the 1953 International Petroleum Exposition in Tulsa as he received an award as "Grand Old Man of Natural Gas" from William G. Skelly, founder and president of Skelly Oil Co. Skelly died in 1957. Cabot, 92 when he made the trip to Tulsa, was active director of all Cabot operations at that time.

Phillips Denies Charge in Antitrust Case

• Company admits it has paid $54.4 million over past 2 years for more than 1 million shares of Union stock, but says it hasn't violated law.

PHILLIPS PETROLEUM CO. has answered the Justice Department's antitrust charges that it is trying to take over Union Oil Co. by admitting it has bought a big block of Union stock, but denying the action violates the Clayton Act.

Phillips even admits it bought the stock after its directors passed a resolution in April 1959 "approving in principle an expansion of the company's refining and marketing facilities into areas not then covered."

The company has maintained it acquired the Union stock as an investment. Justice Department, with support from Union executives, claims Phillips is trying to get control of Union.

In the 12-page answer to the antitrust charges, Phillips reveals it paid $54,521,135 for the 1,263,200 shares of Union bought between April 29, 1959, and November 10, 1960. This figures out to an average price of just over $43 a share.

Phillips says the purchases were made in two phases. Up until May 1960, the company spent $47,664,000 for Union stock. This expenditure came from $50 million earmarked by the board for expansion. The board then approved an additional $5 million in June 1960 to buy Union stock when the price dropped.

In maintaining its argument the stock purchases are an investment, the Phillips answer points out directors also were authorized to sell the Union stock if this looked like the best thing to do.

No hearing was held when Phillips filed its answer in the U. S. District Court of Southern California, Los Angeles.

The next step expected in the proceedings is a hearing March 13. At this time, Phillips will attempt to get a Union cross suit killed. Phillips maintains Union has no right to become involved in a case started by the Justice Department.

What was said . . . While categorically denying any antitrust charges, Phillips, in its answer, confirms some of the allegations made by the Government.

The company agrees it was:

. . . **The largest producer-seller** of natural gas in 1959. Sales that year totaled 774,719,000 M.c.f. of gas sold for $90 million. These sales included 478,809,000 M.c.f. produced by Phillips and approximately 400,000,000 M.c.f. purchased from other producers for $45 million.

. . . **The No. 1 producer** of natural-gas liquids, with 1959 production hitting 37,783,097 bbl. The Government claims Phillips markets and produces 11% of the nation's natural-gas liquids, but the company denies it is the largest marketer.

. . . **The leading LPG** marketer in 1959, with sales of 37,988,352 bbl. realizing $87,819,000.

In denying there is competition on the retail gasoline level between the two companies, Phillips points out the only Phillips 66 service station in California is an outlet opened in 1960 at Needles—and this station sells gasoline provided by Union on an exchange agreement.

The Government charges there is actual and potential competition between the two companies on all levels of operations, from basic research to marketing (OGJ, Dec. 19, p. 63).

The complaint charges that if Phillips gets control of Union, the merged company would rank No. 3 in the nation in refining capacity, No. 6 in retail outlets, and No. 7 in crude production, reserves, and total assets.

An injunction has been issued against Phillips prohibiting the company from voting its Union stock and from buying any more.

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Chemical Construction's On the Upswing

CHEMICAL-INDUSTRY sales are at an all-time high and manufacturers are mapping new facilities at a near-record rate.

The annual construction survey released last week by the Manufacturing Chemists' Association, Inc., shows a projected total outlay of $3,551,030,000 for additional facilities in 1960-61.

This is the second highest total ever reported by the organization.

The MCA believes the outlook for chemical products is the brightest ever, despite a slump in net earnings for chemical manufacturers in 1960.

Officials of the organization say this belief is reinforced by the high level of construction and the record $27.7 billion in sales.

The current construction total was topped only by the 1958 figure of $3.84 billion.

If the MCA survey is any indication, chemical manufacturers look toward general organic chemicals as their big producers in the near future.

How Chemical Construction Is Split

(Spending in millions $)	Planned for 1961	Under way in 1960	Completed in 1960	Total
General Organic	407.60	514.67	339.53	1,261,80
General Inorganic	128.90	296.57	224.09	649.56
Fertilizer	99.90	78.58	46.77	225.25
Laboratories	39.23	96.59	101.09	236.91
Miscellaneous	35.42	141.61	55.28	232.31
Plastics & Resins	25.69	358.39	181.84	565.92
Synthetic Fibers	21.10	132.30	63.40	216.80
Synthetic Rubber	1.00	91.75	7.58	100.33
Metals	13.60	26.90	21.65	62.15
TOTALS	772.44	1,737.36	1,041.23	3,551.03

Texas Court

THE LAWS OF TRESPASS can be used to prevent fracturing of a well when the fractures would cross lease lines.

So says the Texas Supreme Court in a ruling that apparently opens a chink in the legal armor of tiny-tract drillers in the state.

Implications of the decision have sent oil-company attorneys to their law books. For one thing, the court's action raises the possibility that an operator might be sued for damages allegedly caused by "fracturing trespass" which took place years ago.

The ruling settled a confused legal battle over several town-lot gas wells. These were drilled by A. W. Gregg and Christian R. Holmes et al. in the McAllen-Pharr gas field within the city limits of Pharr in South Texas.

Most of the wells were on tracts of less than an acre. All involved in the court case were less than 50 ft. from lease lines of Delhi-Taylor Oil Corp. and Mayfair Minerals, Inc., which held surrounding lease blocks.

Delhi-Taylor and Mayfair went to court in 1959, seeking injunctions to keep Gregg and Holmes from fracturing the wells.

The plaintiffs won in two courts,

Wage Plan Skips Most Stations

MOST service-station operators would keep their exemption from the minimum-wage law under changes proposed by President Kennedy.

The Kennedy measure aims at covering more employes, as well as hiking the minimum wage from $1 an hour to $1.25 an hour.

Here's how it would affect U. S. gasoline dealers:

... **Stations** doing more than $250,000 a year in gross business would come under the minimum-wage provisions. All others would continue to be exempt. Relatively few stations have such a volume of business.

... **Employes** of the plus-$250,000 stations, as newly covered workers, would come in at $1 the first year, $1.05 the next, $1.15 the third, and $1.25 after that.

... **All stations,** whatever their volume, would be exempt from time-and-a-half provisions for hours over 40 in any one week.

The dollar-volume test would apply to company-owned outlets and commission stations as well as to lessee dealers and independently owned stations. Thus the company-owned station, too, would come under the act only if it did more than $250,000 worth of business.

Chains of stations would come under the act only if one or more of the outlets did this volume of business.

Census Bureau figures show that in 1958 there were 2,363 stations with $300,000 or more in sales—just over 1% of the 206,302 stations in the U. S. Census has no figure for the $250,000-to-$300,000 outlets.

PIPELINE

Three 30-in. projects have been finished by Trunkline Gas Corp. Panama, Inc., laid 21 miles of line near DeRidder, La., and 20 miles of line between Byhalia, Miss., and Oakland, Tenn., for the company. Contractor on the third job, 20 miles of line near Senatobia, Miss., was Grayco Construction Co.

Extension of service to Sylvester and Ocilla, Ga., is planned by South Georgia Natural Gas. The company will build two laterals, totaling 2.5 miles, at a cost of $38,700.

The 187-mile, 8-in. pipeline that will carry condensate from dehydration facilities at Hassi R'Mel to the Haoud-el-Hamra station of the

Says Trespass Law Can Block Fracturing

lost in another. District Court rulings were appealed in all cases. But appeals courts in San Antonio and Austin settled nothing. Each reversed the district court from which the appeal was taken.

The Court of Civil Appeals in Austin held that laws of trespass could be used to prevent such fracturing operations. The San Antonio appeals court, however, held that the Texas Railroad Commission, not the courts, was the proper authority.

"Well bore extended" . . . The supreme court declared that the "invasion alleged is direct and the action taken is intentional. Gregg's well would be, for practical purposes, extended to and partially completed into Delhi-Taylor's leasehold.

"While the drilling of the well is not alleged to have extended into Delhi-Taylor's land, the same result is reached if in fact the cracks or veins extend into its land and gas is produced therefrom by Gregg."

As for the jurisdictional dispute, the court held that the question of trespass is inherently judicial. And the courts in such a case, it said, are not ousted from jurisdiction unless the legislature grants exclusive control to the administrative body (railroad commission).

Far-reaching consequences . . . Legal experts feel the impact of this decision could be a broad one.

The law of trespass has been on the books for years. And the fact that a fracture treatment was performed before it was known to constitute trespass probably would not be an effective defense, one attorney points out.

Another possibility is that an operator might be open to suit for damages not solely by another producer but even by his own royalty owner.

This might occur where the operator held several adjacent leases not in a pooling unit. He may have fractured a well on one of them so as to extend fractures across the lease line under another of his leases. It has been suggested that the operator might be sued by the royalty owner of the latter lease.

Proof hard to come by . . . In cases involving tracts of fractions of an acre, proof of this type of trespass probably would not be difficult.

But it would be a different story with larger tracts, where wells are further from lease lines.

There is no way at present to say exactly how far a certain fracture job in a given zone will extend fractures. And there is no way to discover how long they are once they are created.

Humble may switch to Enco this week

HUMBLE Oil & Refining Co. will have a "big news" announcement for its southeastern Texas service-station managers this week.

There was no advance release on the nature of the announcement. But there is speculation that Humble is preparing to disclose that the "Enco" brand name—now being test-marketed in the West—will be displayed in areas served by the Humble brand name.

If Humble decides finally on Enco for its nation-wide name, the tag will ultimately replace Esso, Humble, Carter, Pate, Oklahoma and other names used by the nation's largest domestic oil company.

BRIEFS . . .

Hassi Messaoud-Bougie line is nearing completion. It will be operated by Cie. Francaise des Petroles. It is being built by CREPS and SOCOMAN-TRAPGAZ.

Alaska Pipeline Co. will make another attempt this spring to lay a 12-in. natural gas pipeline across troublesome Turnagain Arm, the one unfinished link in the 74-mile Kenai-Anchorage system. The Arm's viscous bottom and 30-ft. tides prevented the laying of the line last fall.

A 3-mile ammonia pipeline has been laid by Phillips Chemical from the Mississippi River barge-unloading area at East St. Louis to the company's tank-storage terminal. The line is insulated with U-200 urethane and is wrapped with Polyken tape.

The towns of Stem and Roxboro will be joined by an 18-mile, 14-in. gas line being built by Public Service Co. of North Carolina. Contractor is Latex Construction Co.

Outstanding stock of Texas Eastern Transmission will be increased to 30,000,000 shares if stockholders approve a 2-for-1 split. The company expects to continue the annual dividend rate of 80 cents per share.

Seven miles of 8-in. line is being laid in Terrebonne Parish, La., by Tennessee Gas Pipeline. Houston Contracting Co. is the contractor.

AGA's gas-transmission conference in Denver May 25-26 is expected to draw 500 persons. Automation and the use of computers will be the top subjects.

Also for Pipeliners . . .

IN THE NEWS: State control over gas-liquids production is urged by Oil Import Administrator O'Connor (p. 77) . . . First refrigerated LPG tanker is being built for the Japanese (p. 79) . . . Midland area-pricing hearing will set ground rules for others to follow (p. 81) . . . Utility asks California Public Utilities Commission to approve both the Mexican and Rock Springs gas lines (p. 85) . . . Gas from Isthmus of Tehuantepec is flowing to Mexico City industries through new 500-mile line (p. 102).

Refinery Runs in the Southwest Rise Again

- January throughput in five southwestern states is 184,000 bbl. over December. Rate of operations is 91% of calendar-day capacity.

SOUTHWESTERN refinery runs edged up again in January.

Throughput in five southwestern states was 3,455,000 bbl. daily. This was an increase of 184,000 bbl. over December and 45,000 bbl. over January a year ago.

The region also took a bigger share of the national total, increasing from 41.1% in December to 41.5% in January.

Nationally, crude throughput was 8,323,000 bbl. daily. Daily average runs were 297,000 bbl. higher than in December for an increase of 3.7%. Southwestern runs increased 5.6% over December.

The Southwest refiners operated nearer top capacity than the nation as a whole. Runs nationally were about 86% of calendar-day capacity. For the Southwest the figure was 91% of calendar-day capacity.

The 91% level was typical of most areas, however. Although it was far surpassed by the near-capacity operation of refiners in the Minnesota - Wisconsin - Dakota district.

East Coast, West Coast, and Inland Texas were the only areas where runs were held to less than 88% of capacity.

ARKANSAS

(Refinery Runs in Barrels Daily)

Company and location—	January	December	January 1960
American, El Dorado	36,937	31,744	41,154
Lion, El Dorado	32,817	34,302	25,853
MacMillan, Norphlet	3,128	3,532	2,281
Other	4,764	5,452	5,660
Total Arkansas	77,646	75,030	74,948

LOUISIANA

(Refinery Runs in Barrels Daily)

Company and location—	January	December	January 1960
Cities Service, Lake Charles	175,004	165,073	175,068
Continental, Lake Charles	46,348	53,902	56,082
Humble, Baton Rouge	324,729	261,189	309,787
Ingram, Meraux	20,040	12,999	19,278
Shell, Norco	97,754	100,626	102,831
Tenn. Oil Ref., Chalmette	44,054	37,485	24,768
Other	6,700	7,679	7,528
Total Louisiana	714,629	638,953	695,342

MISSISSIPPI

(Refinery Runs in Barrels Daily)

Company and location—	January	December	January 1960
Paluxy, Yazoo City	1,249	1,347	404
Pontiac, Hattiesburg	16,390	16,810	14,566
Southland, Sandersville	4,167	4,121	3,223
Total Mississippi	21,806	22,278	18,193

OKLAHOMA

(Refinery Runs in Barrels Daily)

Company and location—	January	December	January 1960
Allied, Stroud	1,570	2,704	2,723
Anderson-Prich., Cyril	10,144	10,048	10,680
Bell, Grandfield	6,341	6,412	6,737
Ben Franklin, Ardmore	11,435	11,197	11,503
Champlin, Enid	26,566	26,541	27,698
Cities Service, Ponca City	30,223	23,600	31,919
Continental, Ponca City	70,372	63,827	77,800
DX Sunray:			
Duncan	41,042	41,786	39,221
Tulsa	70,859	71,607	69,292
Kerr-McGee:			
Cushing	18,125	18,014	22,563
Wynnewood	17,848	17,736	17,777
Midland Co-op., Cushing	13,370	13,353	12,919
Phillips, Okmulgee	14,376	15,010	18,070
Texaco, Tulsa	*	28,314	34,512
Total Oklahoma	332,271	350,149	383,414

*Not reported to Oklahoma Corporation Commission.

TEXAS

(Refinery Runs in Barrels Daily)

Company and location—	January	December	January 1960
American, Texas City	127,091	98,585	105,586
Am. Petrofina:			
Mount Pleasant	16,342	14,033	14,504
Wichita Falls	6,598	3,437	6,932
Atlantic, Port Arthur	65,650	67,464	38,341
Col-Tex, Colorado City	7,680	7,544	7,914
Continental, Wichita Falls	11,266	11,506	10,121
Cosden, Big Spring	28,984	28,972	29,221
Crown Cent., Houston	34,155	33,384	34,137
Delhi-Taylor:			
Corpus Christi	44,233	40,941	34,720
Port Isabel	5,152	5,304	5,626
Eddy, Houston	2,031	2,054	2,096
El Paso, Odessa	11,441	11,546	10,920
Gulf, Port Arthur	282,072	266,472	279,627
Howell, San Antonio	2,324	2,302	2,711
Humble, Baytown	310,218	281,907	295,310
La Gloria, Tyler	16,799	16,683	15,765
Mobil, Beaumont	217,105	184,106	201,334
Phillips:			
Phillips	53,159	54,295	65,840
Sweeny	69,615	66,489	76,805
Plymouth, Texas City	29,979	27,105	26,450
Pontiac, Corpus Christi	50,394	50,266	46,248
Premier:			
Fort Worth	7,741	7,680	7,803
Longview	2,065	4,645	4,597
Pure, Nederland	79,475	77,075	80,420
Shamrock, McKee	23,384	24,289	19,621
Shell, Houston	115,537	101,689	115,046
Signal, Houston	47,052	49,002	53,101
Sinclair:			
Corpus Christi	16,070	28,712	30,515
Houston	128,430	131,561	127,133
Skelly, Longview	3,077	3,056	3,037
Southwestern, Corpus Christi	31,837	30,738	34,857
Stand. Tex., El Paso	50,532	45,474	53,056
Suntide, Corpus Christi	43,793	40,987	45,263
Texaco:			
Amarillo	16,920	15,500	16,842
El Paso	12,118	9,985	13,477
Port Arthur	234,679	260,054	267,869
Port Neches	40,398	36,548	40,896
Texas City, Texas City	38,121	32,886	29,495
Other	25,047	25,970	19,409
Total Texas	2,308,564	2,199,206	2,272,645

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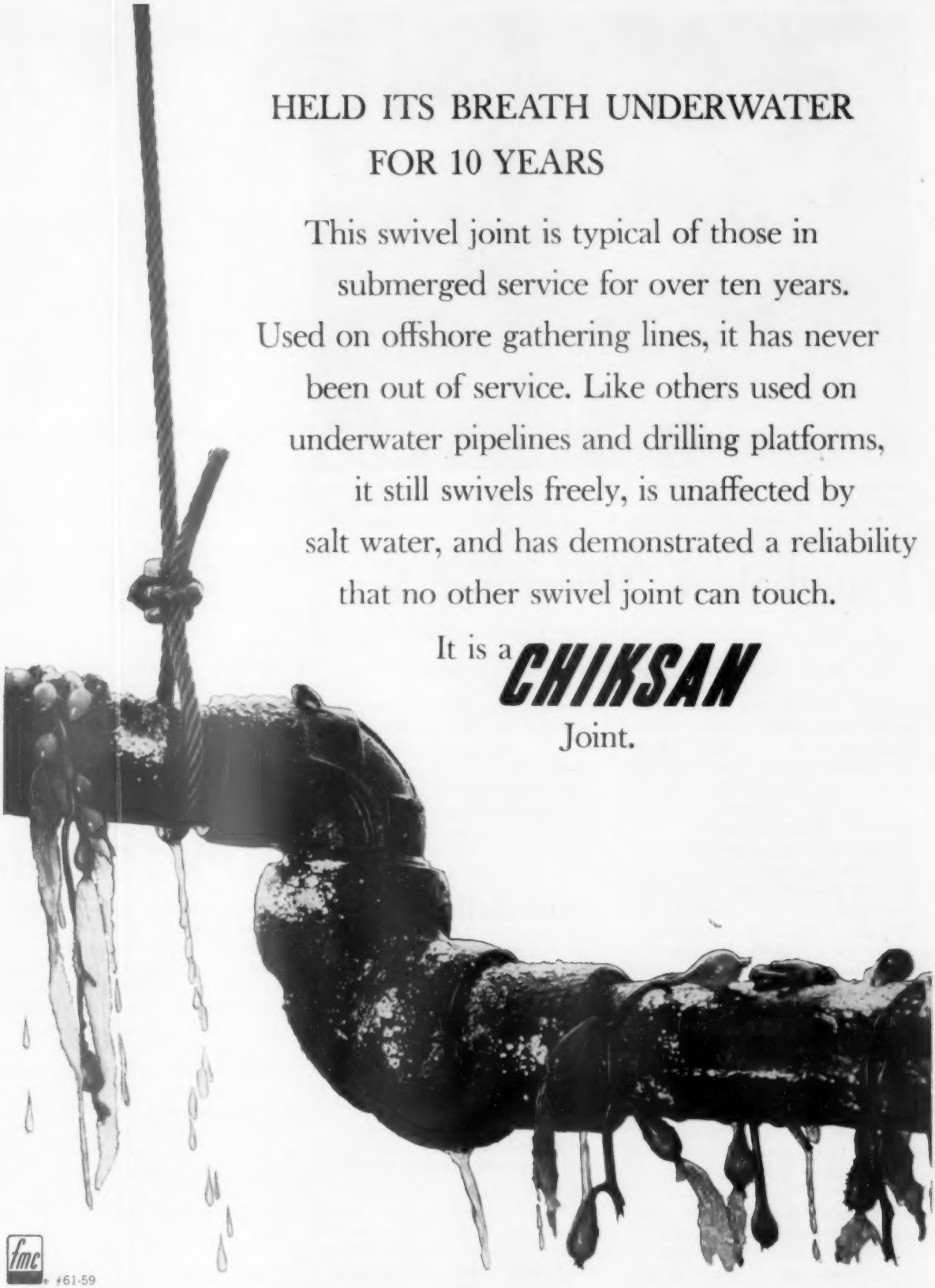
This swivel joint is typical of those in submerged service for over ten years. Used on offshore gathering lines, it has never been out of service. Like others used on underwater pipelines and drilling platforms, it still swivels freely, is unaffected by salt water, and has demonstrated a reliability that no other swivel joint can touch.

It is a **CHIKSAN** Joint.



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Offices and Representatives in Principal Cities of the World

PRODUCT SAMPLE is drawn by Ken Caldwell, left, operator at Ashland Oil's new naphthalene plant, for W. N. Sims, American Cyanamid Co.; R. E. Yancey, administrative vice president of Ashland Oil; and T. H. Paulsen, Ashland's director of research and development.

Naphthalene "Milestone" Set

- **First commercial shipment of petroleum naphthalene leaves the Hydeal unit at Ashland Oil's refinery.**

THE FIRST COMMERCIAL naphthalene produced from petroleum stocks has been shipped from the Ashland Oil & Refining Co. refinery near Ashland, Ky.

Five special tank cars were used to haul new petrochemical to customers across the nation last week. This first shipment totaled almost 500,000 lb., with each of the insulated tank cars carrying about 10,000 gal. of molten naphthalene.

Ashland's kickoff shipment was made only 7 months after ground was broken for a Hydeal unit which produces either naphthalene or benzene.

Up to now, naphthalene has been manufactured from coal tars.

The Hydeal process was discovered by Ashland researchers and developed by the company. Licensing arrangements are being made through Universal Oil Products Co.

Production from the new Ashland unit is expected to range from 75,000,000 to 100,000,000 lb. of naphthalene and as much as 6,000,000 gal. of benzene a year.

Eleven other Hydeal units, using the same basic process in the manufacture of benzene instead of naphthalene, have been licensed through UOP.

Representatives of some of Ashland's naphthalene customers were on hand to acknowledge the first shipment.

Delhi Sells Gas

. . . wells in New Mexico to El Paso Natural Gas.

EL PASO Natural Gas Co. has bought 23 San Juan basin gas wells from Delhi-Taylor Oil Corp., Dallas, in the second major gas deal between the two firms in the past 8 years.

The wells, all shut in, are Dakota sand producers completed by Delhi last year.

The sales contract calls for El Paso to pay $2,700,000 in cash to reimburse Delhi for all drilling, completion, and equipment costs.

Delhi, in addition, will be paid an overriding royalty for all gas produced from the Dakota properties. The rate of this payment initially is 7½ cents an M.c.f. The amount is subject to renegotiation in March 1962.

Further, El Paso has agreed to drill a minimum of 45 wells a year for the next 2 years on the 96,000 acres of leases involved in the contract, and the pact calls for completion of development of the acreage within 5 years. This could mean the drilling of at least 150 wells and perhaps 300.

Delhi's sale of its Dakota sand gas production is closely related to its sale to El Paso in 1952 of its Mesaverde and Pictured Cliffs gas production.

New Brown-Bassett Pay Hit

MOBIL Oil Co.'s 1 Banner-State, which recently made news as the biggest Ellenburger gas producer in prolific Brown-Bassett field in West Texas, has done it again with a good Strawn strike.

The well tapped the Strawn for a calculated open-flow potential of 21,500,000 cu. ft. daily from perforations at 11,205 to 11,642 ft. to establish a fourth commercial gas pay for Brown-Bassett.

The sprawling Terrell County field already boasted production from the Ellenburger, Fusselman, and Wolfcamp zones (OGJ, Feb. 20, p. 80).

PROCESSING

A colorimetric test has been devised by Sun Oil's research and engineering department for testing the odor of wax. It measures the amount of carbonyl stripped from a sample of molten wax. The study shows an 80% correlation between the results obtained in the test and an odor panel's evaluation of the same wax.

TEL and TML projects, revealed last month by Stepan Chemical Co., Northfield, Ill., are being reconsidered. The firm reports it has learned of a potentially important new processing method and will restudy the entire project.

New family of resins will be marketed under the trade name SMA by Texas Butadiene and Chemical

El Paso Plans Big LPG Plant

EL PASO Natural Gas Co. will start construction near Jal, N. M., this summer of a huge LPG extraction plant and a 58-mile, 6-in. pipeline to move the products to its Odessa, Tex., refinery-petrochemical complex.

The big plant will process up to 650,000,000 cu. ft. of gas and extract about 14,000 bbl. of liquid hydrocarbons daily.

Products will include roughly 5,600 bbl. daily of ethane, 7,000 bbl. of propane, and 1,320 bbl. of butane.

Gas will come from El Paso's main transmission lines at a connection just downstream from its Jal No. 1 plant. Site for the new facility is only ¼ mile west of Jal No. 1.

Petrochem raw material . . . The products will be moved through the projected new line in a mixed stream to Odessa.

El Paso Natural Gas Products Co., a subsidiary, plans to use the ethane as raw material for making ethylene, propylene, and polyethylene at two new plants it is now building at Odessa as a joint project with Rexall Drug & Chemical.

Future plans call for adding still another plant for making polypropylene.

Slick Oil Selling Assets to Midhurst

THE SALE of properties of Slick Oil Co., Houston, for approximately $8,950,000, is imminent.

The company, about half-owned by members of the Slick family in San Antonio, will be dissolved after shareholders approve the sale of its assets to Midhurst Oil Co., a Houston-based company.

A. K. Tyson, president of Slick, said stockholders will meet March 14 to vote on the transaction. The company's 2,325,000 shares will pay off at about $3.85 per share.

The properties being sold consist of more than 276 producing wells with a daily production of 1,500 bbl. of crude and 12 million cubic feet of gas.

Also included are 57,000 producing acres, 45,000 nonproducing acres, and interests in the gasoline plant and a gas-gathering system in Louisiana.

The acreage is located in seven southern and western states and in Canada. Most of it is in Texas.

The present Slick company was formed in 1954 from three other Slick companies in San Antonio and Houston. Slick interests are still active in the oil business through the Texstar Co., San Antonio.

Earl Slick and Tom Slick, both directors in Slick Oil Corp., are sons of the late Tom B. Slick, Oklahoma wildcatter.

Midhurst will increase its production about one-third by taking over the Slick properties. Its principal production is in Texas and Louisiana. Flavy E. Davis, Houston, is president.

Alaskan Well Suspended

A SECOND deep wildcat in the Katalla-Yatataga area of the Gulf of Alaska has been plugged and suspended, but the operator hasn't said whether either well is dry or has prospects of making a producer.

Richfield Oil Corp. took the 2 Kaliakh River unit to 12,135 ft. before plugging it. The first test in the area, the 1 Kaliakh, went to 14,699 ft. and was suspended. The first well is about 2 miles south of the second.

The tests are the first drilled by Richfield on 1,060,000 acres held under two development contracts. The company recently took in two partners in the operation, Sinclair Oil & Gas Co. and BP Exploration Co. (Alaska). Both acquired 25% interest.

BRIEFS . . .

Corp. Semicommercial production of the low-molecular weight styrene-maleic anhydride resins has begun at the firm's 1-million pound per year Miami, Fla., plant. This is the firm's first venture into resins and plastics.

Premium gasoline last month averaged 99.3 RON, unchanged from January and from February a year ago. The monthly Ethyl Corp. survey shows regular gasoline at 92.6 RON was unchanged from January but 0.3 numbers higher than February 1960. Average TEL contents in February were 2.33 ml. per gallon of premium and 1.52 ml. per gallon for regular.

New gasoline name has been announced by Pure Oil Co. Effective March 6, Firebird Super and Firebird Regular will be available throughout the company's 24-state marketing area. Although the old names—Pure Pep and Pure Premium—are well established, Pure says its new combination of additives will boost performance to such a degree that a name change is justified.

An acetylene plant to be built by Du Pont at Montague, Mich., will be the first commercial installation to produce acetylene by cracking hydrocarbons with an electric arc. The 50 million pound per year unit will supply raw material for a neoprene plant which the firm operates at Montague.

An ammonia unit will be built by Diamond Alkali Co. as part of the acetylene complex it has under construction at Deer Park (Houston). Diamond expects to begin construction this summer and complete it in 1962. The firm will supply its own hydrogen, while nitrogen will come from an oxygen plant which Linde Co. will build adjacent to Diamond. C. F. Braun & Co. is contractor for the project.

Propylene carbonate facilities are now on stream at Dow Chemical Co.'s Freeport, Tex., plant. The firm had been producing the material for some months in pilot-plant quantities.

Indiana's first LPG-storage cavern is being mined in shale at the Little Big Inch terminal of Texas Eastern Transmission Corp. at Princeton, Ind. The 150,000-bbl. cavern will be used for propane storage.

Venezuela Advised to Revamp Oil Policies

• Economic mission reportedly tells government: Ease tax laws for private oil companies and give them a better break all the way around.

A SPECIAL economic mission is suggesting to Venezuela that it consider some changes in its oil policies if it wishes to strengthen its weakening position in world oil markets.

The mission was organized by the International Bank for Reconstruction and Development (IBRD) at the request of the Venezuelan Government. The study covers Venezuela's general economy but pays particular attention to oil.

The report made by the mission has not been made public, but it is understood that the oil-related suggestions are along the following lines:

Tax changes . . . The mission's report is said to suggest at least three possible tax changes that would encourage oil firms by lessening their tax burden and strengthening their competitive position and also improve oil-company confidence in long-range government oil policies.

One of the suggested changes provides that no income tax would be levied on an amount equivalent to all or part of the net investment by a company in a given year. This would enable a company to make more profit and encourage it to expand its investments, thereby providing Venezuela with more oil reserves and productive capacity.

Another suggestion is that prices on which royalty payments are based could be related to Venezuelan prices rather than to posted prices at some other point, such as the Texas Gulf Coast.

The third suggestion is said to be that special exchange rates for petroleum sales could be modified or eliminated so that the sales would be made at the general exchange rate instead of the less attractive rate now provided for petroleum transactions.

Government oil operations . . . It is understood that the mission in its report is suggesting that Venezuela would probably be making a mistake if it pressed for government development of the nation's oil resources.

This mission, noting that the government set up the Venezuelan Petroleum Corporation last year, points out that any major government oil effort would be a drain on the nation's budget and that it would tend to discourage oil development by private capital.

It suggests that Venezuela would benefit more through reasonable taxes and other oil policies applied to private companies than it would trying to build up a big state oil enterprise.

Concessions . . . The mission also questions Venezuela's announcement that no new concessions will be granted.

The mission makes no all-out defense of concessions as such, but is said to point out in the report that future development of the Venezuelan economy would be greatly advanced if the government were to recognize the important role that private capital can play.

As it is, the mission suggests, there has already been some loss of confidence by private investors as a result of the "no concessions" decree.

Outlook . . . The mission reportedly recommends to Venezuelan officials that other phases of that nation's economy be bolstered so Venezuela will not be so dependent on oil revenue.

The mission emphasizes that oil can continue to play a very important role for a long time to come, particularly if government action does not discourage private development. But the mission points to the need for stimulation of other segments of the economy to help carry part of the load previously carried largely by oil.

One reason for this attitude on the part of the mission is that changes in the world oil picture indicate Venezuela can expect a much lower rate of oil growth and oil revenue in the years ahead.

Development of oil sources in the Middle East, in Africa and elsewhere, together with U. S. import restrictions and the continuing growth of Russian oil exports, simply mean that Venezuela can expect to get less of the world's oil market.

The mission estimates that the market price for Venezuela crude during the next 4 years will probably average about 3% less than the price level of 1959-60.

The mission bases this prediction on the fact that new discoveries around the world have caused oil availability to increase at a faster rate than world oil demand.

However, action by Middle East and other nations to stabilize prices probably will mean that Venezuela need not fear any drastic drop in its oil revenues in the near future.

For a longer period, the mission is said to believe that Venezuela should consider the possibility that it will get lower oil prices.

The mission notes in its report that Venezuela faces the problem of continuing high costs of production—well above that of Middle East nations.

However, the mission concludes, operating costs and/or taxes are also increasing in other areas so that Venezuela may find itself in a better competitive position eventually, particularly if it makes tax adjustments or other concessions to Venezuelan producers.

If it makes such adjustments, it probably will be able to maintain a 4% annual growth rate during the next few years.

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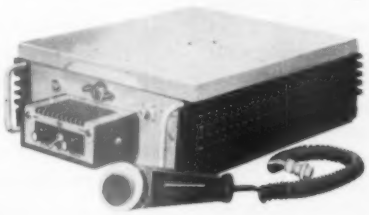

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Europe's Oil Demand Will Double by 1975

• That's the flat prediction of the OEEC in a new study of the oil scene in western Europe. In 15 years, despite governmental sniping and rugged competition from other fuels, demand for oil will top 6,000,000 bbl. daily.

NEITHER government interference nor a tough, competitive energy market is likely to hobble the continued growth of oil consumption in Europe.

Government interference is already developing at some of Europe's primary oil sources. It is possible that the same kind of interference may develop in Europe's markets.

Still, oil will take an increasing share of one of the world's primary energy markets — and Europe is lucky the oil is available.

These points form the essence of the latest oil study published by the 18-member Organization for European Economic Cooperation.

The fourth major energy study prepared by the OEEC since 1955, the new document is the second to deal primarily with oil.

It is the first such study to recognize a trend toward governmental influences on normal supply-demand factors. The OEEC warns against excessive use of those forces, either by producing or consuming governments, because the "unimpeded flow of oil" has a direct bearing on the "future economic well-being" of both.

After analyzing what has happened in the world's oil industry and in Europe—particularly since 1955—the OEEC reaches definite conclusions. Here are some of them:

... **Demand for oil** in Europe has risen from 2,000,000 bbl. daily in 1955 to well over 3,000,000 bbl. daily last year. The study endorses past predictions that western Europe's oil demand will be between 4,000,000 and 4,800,000 bbl. daily in 1965. This consumption will reach 6,000,000 to 7,800 000 bbl. daily by 1975.

... **Oil's share** of total energy markets has risen from 21% in 1955 to almost 30% last year. The study predicts oil will supply from 30 to 32% of western Europe's energy by 1965 and between 35 and 39% by 1975.

... **Oil supplies** from the Middle East and Venezuela will continue to increase in future years, but the share of Europe's total oil supplied by these two historical sources will fall as North African oil — and possibly Russian supplies—begin to grow.

... **Natural gas,** particularly supplies from North Africa, may play a big part in future energy supplies for Europe, but today it is too early to tell just what role gas will play.

... **Refining capacity** is still growing and will continue to grow in Europe, with refineries moving inland and increasing in size.

... **Trunk pipelines** are now economic in Europe because of the scale of demand. These lines, already starting, will grow more to serve the inland refineries and consuming areas.

... **Tanker fleets**, already in excess of demand, probably will maintain that edge for some time to come.

... **Oil investments** in Europe will continue at a high rate to keep up with the growth in demand. OEEC estimates that investment for oil facilities in Europe will total $20 billion in the 20-year period from 1955 through 1975. The bulk of this capital will continue to come from oil-industry earnings, but more of it is being raised in capital markets than before.

Consumer control . . . Because of surplus oil supplies for the past 2 years, prices have gone down and a very competitive market situation has developed in Europe.

This has led to a scramble for markets furnished by heavy fuels, the area's biggest single need. Cheap heavy oil has endangered the coal industry in several of the OEEC's member countries and this brings the threat of some government intervention.

The consumer, says the OEEC, has benefited because he has a choice of competing fuels. The consumer no longer needs to fear a short oil supply because of sharp increases in production, readily available and cheap transport facilities, and more sources for oil.

For these reasons, the report points out, consumers in an individual European country may not agree with a government's desire to restrict oil for the sake of a local coal industry.

"Some governmental intervention may be necessary, particularly if excessive short-term pressures could cause long-term harm to a country's economy. Consumers would not benefit from a situation that forced prices so low as to jeopardize the generation of sufficient capital for future development.

"But Europe's growing interest is as a consumer of energy and any long-term policy by governments, either within or outside Europe, which limited the free flow of oil at prices consistent with its successful future development, could have

FOREIGN

Contract for a storage depot at the Meshed terminal of a 360-mile 8-in. products pipeline from Tehran has been awarded to Williams Brothers Overseas Ltd., which also is building the pipeline. The $2.8-million depot will supply products for Khorrassan Province in northeastern Iran.

A discount of about 30 cents per bbl. off posted price has enabled Gulf to win a 3-year supply contract with Uruguay for 6,733 bbl. daily of Kuwait crude and reconstructed crude. A laid-down price of $2 per bbl. won out over offers from other suppliers, including Russian and French Saharan producers.

An expanded 1,200-bbl. refinery at Bridgetown, Barbados, has been

serious consequences for Europe's future economic strength," the report says.

Exporter control . . . The report also notes the threat of control at the other end of the scale—from producers.

"Oil-exporting countries are concerned at the fall in oil prices and some of them have joined together with the object of protecting oil revenues," the OEEC says with obvious reference to the Organization of Petroleum Exporting Countries (OGJ, Feb. 27, p. 78).

CVP Sets Maracaibo Tests

VENEZUELA'S fledgling government-oil company is opening an office in Maracaibo and plans to start operations in Lake Maracaibo this month.

Venezuelan Petroleum Corp. (CVP) has already let contracts for three platforms in the lake. Local firms will build two platforms. Raymond-Brown Root CA will install the third.

Drilling contracts are expected to be awarded in March. Venezuelan personnel will be used exclusively on the first well. This probably will be drilled on a semi-proven, central lake area known as Block 17 (OGJ, Jan. 9, p. 64).

Dispute Cuts Abadan Output

• Flare-up between Iraq and Iran over responsibility for berthing vessels at refinery causes slowdown in runs.

IRAN'S big Abadan refinery faced a near shutdown last week in a dispute between Iraq and Iran over berthing on the Shatt al-Arab River.

Refinery runs that normally average about 350,000 bbl. daily were sharply curtailed after Iraqi pilots of the Basrah Port Authority refused to handle ships to or from Abadan.

Unless the quarrel is settled, throughput will be limited to the 55,000 or 60,000 bbl. daily required to fill domestic demand.

The squabble, which broke out near the anniversary of the nationalization of the Iranian oil industry in 1951, resulted from an announcement by the Iranian Government that it would handle the berthing of vessels at Abadan from now on.

Iraq has handled berthing arrangements until recently because Iran was unable to supply facilities at Fao. When Iran disclosed its plans to take over berthing operations, Iraqi pilots went out on strike.

Under a 25-year-old agreement, tanker pilots on the Shatt al-Arab are Iraqis and Iran is to control berthing arrangements. The river, as it approaches the Persian Gulf, forms the boundary between the two countries.

Abadan refinery is operated for the Consortium group by Iranian Oil Refining Co.

New Dominican Test Slated

THE Dominican Republic has logged another dry hole, but the American and Dominican interests which have concession rights are preparing to try again.

Petrolera Dominicana and H. S. Cole, Jr. & Son, drilled to 6,568 ft. in Barahona Province south of Palo Alto and abandoned the well in late January. The rig has now moved 12 miles to the northwest near Mella and is preparing to spud.

Last year the two companies had shows in two 10,000-ft. wells in Azua Province but found nothing commercial.

The Cole firm is Houston based. Petrolera Dominicana is owned by Cole; William D. Pawley, Miami; and a Dominican Republic group.

BRIEFS . . .

officially opened by Mobil International. Mobil acquired an interest in the plant last year from Barbados Union Oil, a local independent marketer.

A new exploration permit in the southwestern French Sahara has been awarded to Ste. des Petroles de Valence, owned jointly by British Petroleum and Bureau de Recherches des Petroles. The 7,330-sq.-mile area, known as Hassi Labbar, is near the Mauretania-Spanish Sahara border.

A $30-million refinery is under construction on Payardi Island near Colon, Panama, by Refineria Panama. SA, which is jointly owned by Continental Oil and National Bulk Carriers. The installation, consisting of a crude unit, visbreaker, catalytic reformer, hydrogen desulfurizer, asphalt and boiler plants, is scheduled for completion early next year. Bechtel Corp. is general contractor.

A well making 1,100 bbl. daily from a new, deeper pay zone in West Pakistan's Dhulian field is spurring plans for more drilling into the Jurassic formation. The well, Dhulian 39, was brought in by Attock Oil Co. last year with an initial flow of 650 bbl. daily.

A 10,000-sq.-mile concession in Yemen which formerly was held by Overseas Investment Corp. has been taken over by Houston independent John W. Mecom.

After a 100-day voyage from Houston to the Persian Gulf, a marine pipelaying barge owned by Brown & Root, Inc., will be used in laying two 32-in. crude lines a distance of 25 miles from the Iraqi coast to offshore loading docks. The lines will be laid for Iraq Petroleum Co.

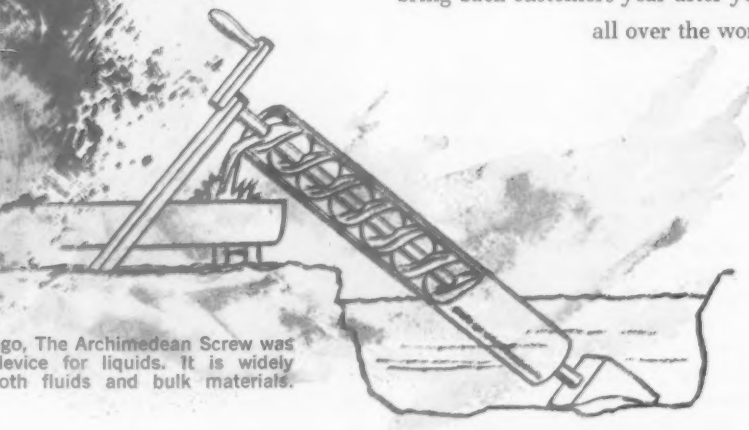
Contract for a Peruvian refinery has been awarded to Fluor Corp. by Refineria Conchan - California, SA, a company owned by a group of Peruvians and by Standard Oil Co. of California. The 6,659-bbl. crude unit will be built at Conchan.

Laying of the 24-in. natural gas pipeline from Hassi R'Mel to Arzew, Algeria, has been completed and the line is now being tested. First gas is scheduled to be turned into the line this month. Metering stations are being built at Relizane and Damesne and cathodic protection is being installed.

THE QUALITY OF THINKING

Archimedes, the ancient Greek philosopher, developed principles of mathematics and mechanics which unlocked secrets leading to the development of some of our most modern processes. His mind was at home in the farthest reaches of the abstract, at work in the closest confines of the practical.

At Brown & Root — whether it is one mind, or a group of minds — thinking knows no boundaries for inspiration. Problems in engineering and construction are solved in ways that consistently save our clients time and money. Brown & Root places a premium on the quality of thought, combined with thoroughly-seasoned knowledge and experience. The results bring back customers year after year, all over the world.



Over two thousand years ago, The Archimedean Screw was introduced as a lifting device for liquids. It is widely used today in moving both fluids and bulk materials.

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World Crude Mark Set

- Domestic gains plus surges in Saudi Arabia and Venezuela push December's output to a new height.

FREE-WORLD oil fields reached an all-time high in December with gains in Saudi Arabia, Venezuela, Canada, and the U. S.

Major Middle East producers other than Saudi Arabia were down slightly, but their year-end output still was high enough to add to impressive over-all gains for the year.

Kuwait's 1960 average was 1,623,700 bbl. daily, up 17.3%. Iran averaged 1,047,000 bbl. daily, up 13.4%; Iraq averaged 962,400 bbl. daily, up 13.5%; and Saudi Arabia averaged 1,247,100 bbl. daily, up 13.8%.

Venezuela's year-end production of 2,833,000 bbl. daily brought the yearly average to 2,846,100 bbl., a gain of 2.71%. The advance was made despite a decline in Creole output of 14,000 bbl. daily to 1,093,900 bbl., and a 63,700-bbl. drop in Shell output to 753,900 bbl. daily.

TREND OVER THE LAST YEAR

(Thousands of barrels)

	Western Hemisphere less U. S.	Middle East	Total free world outside U. S.
1959			
December	4,242.6	4,676.8	9,907.0
1960			
January	4,316.5	5,065.3	10,334.7
February	4,389.5	4,986.5	10,313.2
March	4,156.4	5,146.3	10,346.8
April	4,069.5	4,925.5	10,055.1
May	4,317.4	5,286.2	10,680.2
June	4,285.4	5,164.5	10,568.2
July	4,214.2	5,103.5	10,448.3
August	4,320.1	5,146.8	10,602.5
September	4,311.3	5,500.2	10,941.3
October	4,243.9	5,630.6	11,104.5
November	4,223.8	5,496.0	10,999.2
December	4,347.7	5,550.1	11,157.9

World-Wide Crude Production: Daily average in thousands of barrels

Country—	Dec. 1960	Nov. 1960	Dec. 1959
Western Hemisphere			
Argentina	225.0	221.8	136.2
Bolivia	7.8	8.2	9.1
Brazil	89.0	89.0	74.7
Canada	540.9	520.0	551.7
Chile	22.0	20.0	18.9
Colombia	156.9	158.1	154.8
Cuba	0.2	0.2	0.6
Ecuador	7.7	7.7	7.1
Mexico	290.0	290.0	260.3
Peru	52.5	52.5	50.8
Trinidad	122.7	122.7	115.8
Venezuela	2,833.0	2,733.6	2,862.6
Total	4,347.7	4,223.8	4,242.6
Europe			
Austria	45.1	45.1	46.0
France	40.5	39.5	36.4
West Germany	110.3	111.3	101.8
Italy	40.4	45.7	38.7
Netherlands	38.9	39.2	33.4
United Kingdom	1.7	1.7	1.7
Yugoslavia	23.5	25.0	13.0
Total	300.4	307.5	271.0
Middle East			
Bahrain	45.1	45.1	45.0
Iran*	1,158.0	1,167.0	939.0
Iraq†	975.3	989.6	896.9
Israel	2.3	2.3	2.5
Kuwait	1,647.0	1,649.2	1,302.5
Neutral Zone	154.4	149.2	122.0
Qatar	169.6	161.8	152.4
Saudi Arabia	1,392.0	1,325.4	1,209.6
Turkey	6.4	6.4	6.9
Total	5,550.1	5,496.0	4,676.8

Country—	Dec. 1960	Nov. 1960	Dec. 1959
Other Asia			
British Borneo	93.1	93.1	101.9
Burma	10.5	10.5	12.3
India	8.5	8.5	8.5
Indonesia	398.7	434.8	380.0
Japan	12.4	12.4	8.8
New Guinea	4.5	4.5	4.5
Pakistan	5.9	5.9	6.8
Total	533.6	569.7	522.8
Africa			
Algeria	316.0	294.5	92.7
Angola	1.5	1.5	1.2
Egypt	70.2	67.8	61.4
Middle Congo	2.0	1.9	
Gabon	15.3	15.4	14.4
Morocco	1.8	1.8	2.1
Nigeria	19.3	19.3	22.0
Total	426.1	402.2	193.8
Free World			
Foreign	11,157.9	10,999.2	9,907.0
United States	7,150.0	7,133.0	7,193.0
Total	18,307.9	18,132.2	17,100.0
Communist Countries in Soviet Orbit			
Romania	231.0	231.0	229.0
Russia	3,120.0	3,120.0	2,688.0
Other Communist	100.0	100.0	100.0
Total	3,451.0	3,451.0	3,017.0
WORLD TOTAL	21,758.9	21,583.2	20,117.0

Figures are from reliable industry reports or government sources. Estimates are made where complete reports are lacking. *Includes estimated 6,000 bbl. daily from Naft-i-Shah field not operated by Consortium companies. †Includes estimated 3,500 bbl. daily from Naft Khaneh field, operated by Iraq Government.

Spanish Sahara Test Started

- **Industry will follow Union-Iberica wildcat closely since it's scheduled to go to basement rock or 13,000 ft.**

A DEEP WILDCAT which is slated to go to basement rock in the Spanish Sahara was spudded last week by Union Oil Co.

The Daora 1-1 is located 2½ km., or 1.6 miles, east of the Atlantic Coast a few miles south of the Moroccan border. The site is in Block 1, one of the three blocks Union holds jointly with Cia. Iberica de Petroleos in the northern part of the Spanish Sahara. The blocks cover 1,750,000 acres.

Concession terms call for Union, the operator, to drill to basement or to 13,000 ft., whichever is reached first.

Last week's spudding launched the second actual drilling operations in the new concessions granted in the Spanish Sahara. The only other rig active is one drilling a series of stratigraphic tests for Gulf Oil Corp.

One other well is drilling in this area. The Italian Government agency, AGIP, is drilling ahead at 6,800 ft. in a wildcat in Morocco about 25 miles north and east of the Union well.

The rig . . . Equipment for the Union operation came from France.

An Ideco Super 711 rig was manufactured in Nantes, France, by the Batignolles organization under an Ideco license. The rig is rated at a maximum of 15,000 ft.

Four French-manufactured Saurer V-12 diesel engines make up the rig's power plant. And the rig has two 1,000-hp. Ideco mud pumps.

The new rig was shipped from the Nantes plant to Las Palmas, in the Canary Islands, then moved to the mainland in landing crafts. The LCT's beached the equipment at Aaium, a small village about 60 km. south of the drilling site.

The drilling contract is a joint venture between Camdrill International, Inc., and Cie. Industrielle de Travaux (Citra), a French contractor.

Australian well . . . Union is drilling ahead at its 1 Cabawin test in the Surat basin of Australia after being plagued with a number of drilling problems.

Drilling was held up for several weeks because of time spent in recovering two fish in the hole. The first fishing job came shortly after the operator had a gas kick at about 9,900 ft.

Union, Kern County Land Co. and Australian Oil & Gas Corp. hold 40 million acres in Queensland, Australia.

Contract Let for Australian Refinery

A CONSTRUCTION contract for a 37,800-bbl. refinery near Adelaide, South Australia, has been awarded by Standard-Vacuum Oil Co. to M. W. Kellogg Co.

The new plant will raise Stanvac's crude-processing capacity in Australia to about 80,000 bbl. daily. The company's existing plant at Altoona, near Melbourne, has a current throughput capacity of 42,000 bbl. daily.

The refinery will be built on a 594-acre site at Port Noarlunga, 14 miles south of the South Australian capital. Ground will be broken in mid-year. Start-up is scheduled for January 1963.

Major process units in addition to crude and vacuum units will include a hydrodesulfurizer, catalytic reformer, and sulfur recovery units.

The plant will be designed to operate on Persian Gulf crude. Plans are to market the entire output of the new refinery in Australia.

A smaller refining project by Amoco Australia Pty, Ltd., has been given an assured market for products as an inducement by the Queensland Government.

The Indiana Standard subsidiary has an agreement to open a 15,000-bbl. plant at the mouth of Brisbane River by the end of 1966. The project will be the company's first in the country.

The government reportedly will buy all its products, except asphalt, from Amoco for 10 years. It also will take some asphalt when a contract with another refiner expires.

Gas Flowing to Industry in Mexico City

NATURAL GAS from the Isthmus of Tehuantepec has begun flowing to industrial customers in Mexico City.

Petroleos Mexicanos completed its 500-mile, 24-in. line from Ciudad Pemex to the Ciudad del Carpio terminal near Mexico City in January. Flow of gas to industrial users is expected to increase as additional laterals are built.

Gas for home and small-business heating is not yet possible because Mexico City has no gas-distribution system.

In a progress report last week, Alfonso Barnetche, Pemex manager of production, said drilling activity, now at a reduced rate, will begin to pick up as the seasonal rains subside.

Barnetche said Pemex is now operating 70 of its own rigs and has 23 idle. And the company has 34 contract rigs at work while 17 are idle.

He indicated there will be no big drilling push this spring, even with the pickup, since Pemex production now exceeds refining capacity by 30 000 bbl. daily.

Barnetche said all projects at the Ciudad Madero refinery scheduled for completion by this time have been finished. These include a 35,000-bbl. fluid cat cracker, a 53,000-bbl. high vacuum unit, a 15,800-bbl. Perco unit, and a small poly unit. A 6,300-bbl. asphalt plant is scheduled for completion in November.

PETROLEUM
NEWS
from
Allied
Chemical
• technology advances aid drilling
• new alkylation catalysts with BF3
• profit boosters for refining and gas treating
• corrosion protection for pipelines

Use of Solvay Calcium Chloride in oil well drilling is expanding rapidly as a result of many important new applications developed by technology. For example, it has been found that the addition of 1 per cent, or less, of Solvay Calcium Chloride in drilling mud filtrate almost completely eliminates clay hydration and is a big factor in the prevention of formation damage.

Among current uses are: as a workover fluid, a completion fluid, a carrier for gravel in gravel packing, an accelerator in cement, an additive in acidizing a solution to inhibit solubility of calcium sulfate, and as a bit lubricant (in combination with potassium stearate in soft water areas). For more information on uses, and for physical property data, write for Solvay's new booklet, "Calcium Chloride in Oil Well Drilling Applications."

- *Drilling technology discovers many new advantages in calcium chloride use*

SOLVAY PROCESS DIVISION

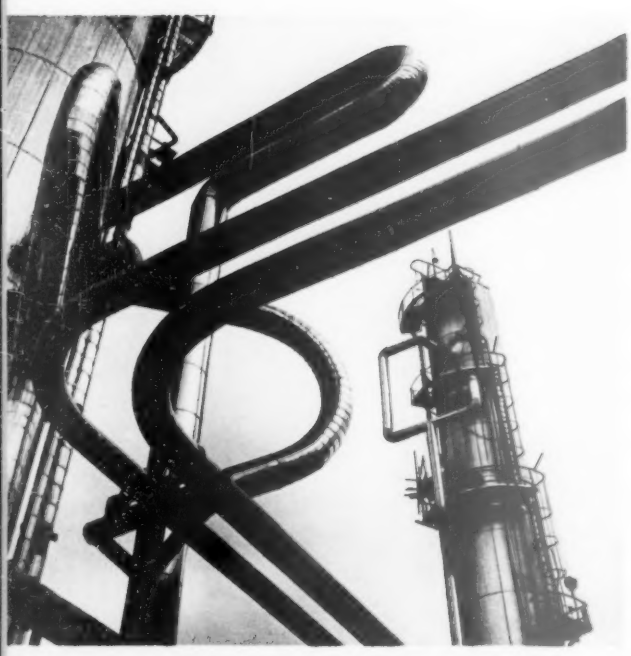
• *Costs cut, problems avoided with new alkylation catalysts made with Allied Chemical Boron Trifluoride*

Excellent results have recently been obtained by the use of General Chemical Division BF_3 in solid catalysts for the alkylation of isobutane with ethylene to produce diisopropyl...and substantial savings can be anticipated in other similar applications. These new alkylation catalysts bypass several problems encountered with many known catalysts. For instance, they can be used at low temperatures—avoiding undesirable side reactions and mixing problems due to changes in viscosity.

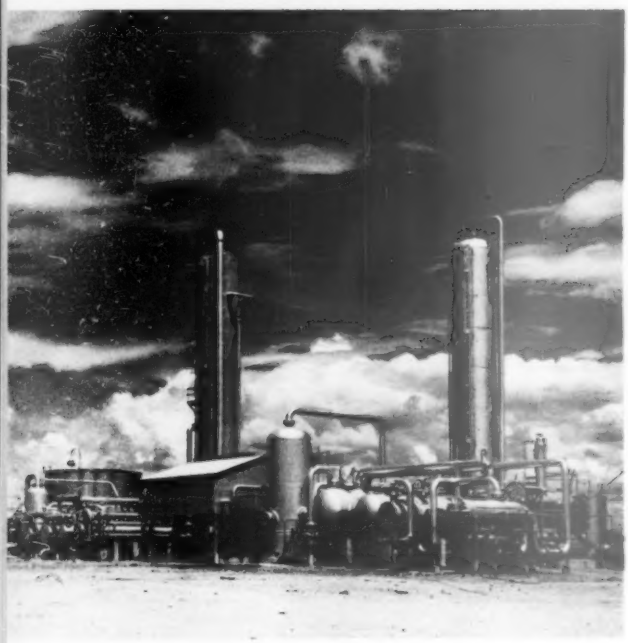
America's primary producer of two widely-used, basic alkylation catalysts—hydrofluoric acid and sulfuric acid—General Chemical has also long been a leader in BF_3 research and production. Perhaps BF_3 holds the answer to your organic synthesis problem. Ask for technical data on properties and uses.

GENERAL CHEMICAL DIVISION

• *Ammonia, ethanolamines and glycols from Allied Chemical conserve equipment, boost profits in petroleum and gas treating industries*



In many American refineries, ammonia from Nitrogen Division, the nation's largest producer, is protecting equipment from corrosion—holding down replacement costs. Used to neutralize the acid constituents of oil, it is one of the lowest cost neutralizing agents available to refiners.



In the gas treating industry, millions of dollars of additional revenue are now produced from wet and sour gases once flared as a nuisance—thanks to Nitrogen Division glycols and ethanolamines. These versatile chemicals remove impurities and excess moisture from natural, flue and process gas streams, in "scrubbing towers," preventing hydrate formation, both in gas treating plants and in long distance gas transmission lines. They are immediately available in quantity from locations in principal producing areas. Prices, shipping data and technical assistance available on request. ■ **NITROGEN DIVISION**

- *Thousands of miles of oil and gas pipelines protected from corrosion by Allied Chemical pipe coating materials*

For ease and speed of installation, efficient service and all-around economy, you can't beat thin-walled steel pipe in pipeline applications. Yet, this pipe would speedily succumb to the corroding effects of soil, moisture and electric currents, were it not for its shield of pipeline primer coating and wrapper.

A leader in the field for over half a century, Allied Chemical has accumulated a great store of "grass roots" experience on pipeline protection, a precise knowledge of the best systems to use under specific conditions, and a line of cleaners, thinners, fluxes and pipe wraps scientifically developed to give long, trouble-free service. Write for the 64-page "Field Manual of Natural Gas, Oil and Gas Pipelines" or contact our technical service experts about your particular problem. ■ **PLASTICS DIVISION**

• *basic to America's progress*

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INTERNATIONAL DIVISION — Selling Allied Chemical products for export markets.

NATIONAL ANILINE DIVISION—Adipic acid; Dodecenyl succinic anhydride; Fumaric acid; Maleic anhydride; NACCOLENE oil-soluble detergent; NACCONOL detergents; NACCOSOL wetting agents; NADONE cyclohexanone; NATIONAL dyes and pigments; NAXOL cyclohexanol; Organic chemicals and solvents; Phthalic anhydride; Succinic acid and anhydride.

NITROGEN DIVISION — Ammonia liquor; Anhydrous ammonia; Ethylene glycol; Ethanolamines and Ethylene oxide.

PLASTICS DIVISION — A-C polyethylene wax additive to lubricants and asphaltum; Coal-tar saturated pipeline felt and fabrics; Phenol; Pipeline enamels; Protective paints and coatings; Tank bottom compounds; Tar acids.

SEMET-SOLVAY DIVISION — Engineering services; Pipes and valves.

SOLVAY PROCESS DIVISION — Aluminum chloride; Ammonium chloride; Calcium chloride; Caustic potash; Caustic soda; Chlorine; Hydrogen peroxide; MUTUAL chromium chemicals — Sodium bichromate, Sodium chromate; NITROX cleansing, neutralizing rust inhibitor; Ortho-dichlorobenzene; OZENE solvent; Potassium carbonate; Soda ash; Sodium nitrite.

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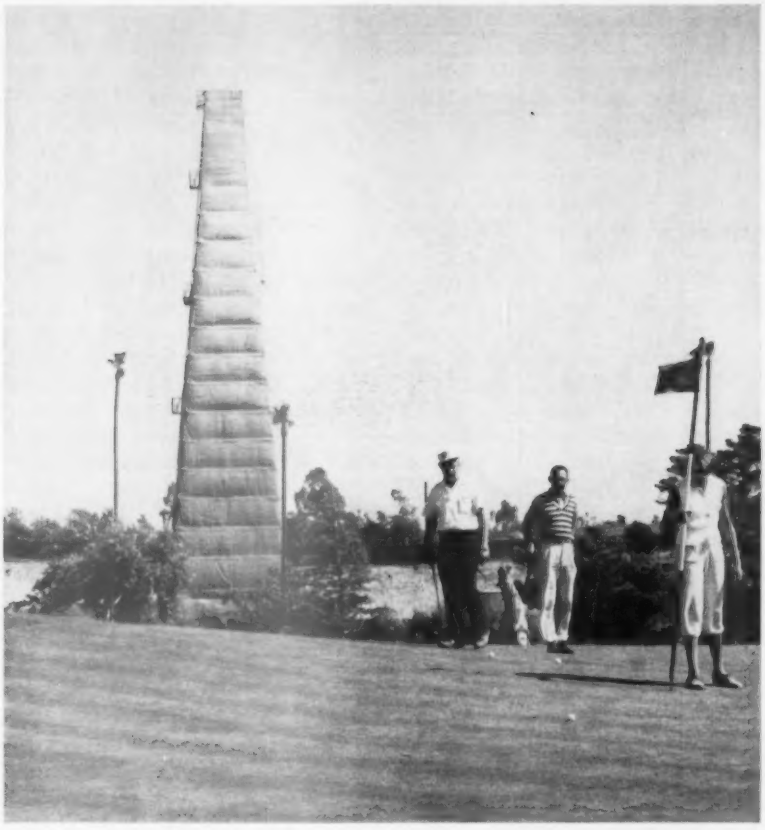
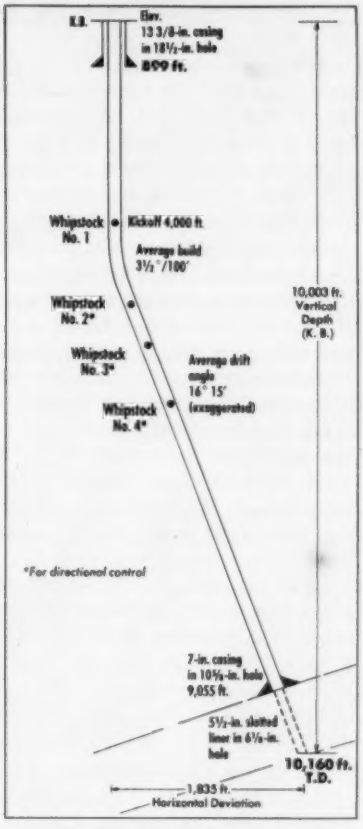


SPECIALLY MODIFIED RIG drills on golf course at Rancho Park in Los Angeles.



TYPICAL WELL in Cheviot Hills.

Signal Oil & Gas is running two rigs drilling directional holes in West Los Angeles. The company's experience here and elsewhere in California has turned up some tips on

How to drill a slant hole

BY CARL LAWRENCE
West Coast Editor

DRILLING CREWS in many of the fields on the West Coast face the problem of having to purposely drill crooked holes.

Directional drilling is a must in developing a big percentage of California's oil reserves. Many of the fields are either in the tidelands where platforms are prohibited or too expensive, or the fields are in town-lot areas where drilling is restricted to slant drilling from compact drill sites utilizing soundproofed rigs.

Some of the ground rules on what to expect in a directional drilling program have evolved from the town-lot drilling done by Signal Oil & Gas Co. in Cheviot Hills field in West Los Angeles.

Signal is running two rigs in West Los Angeles on acreage held jointly with Richfield Oil Corp. One drill site is on city-owned Rancho Park golf course; the other on Hillcrest Country Club. The company has completed 19 wells on the acreage and made about 237,000 ft. of hole.

Costs. Total cost of a town-lot well in Los Angeles runs about 50% more than drilling a straight hole in open territory, but much of this added cost goes into site preparation needed to meet city regulations and into the time and labor spent in acquiring and processing town-lot leases.

Actual drilling costs also are higher and increase proportionately to the amount of deviation in the hole. Two things which have an effect on costs are: (1) The amount

of deviation angle required and, (2) the amount of time operating in open hole.

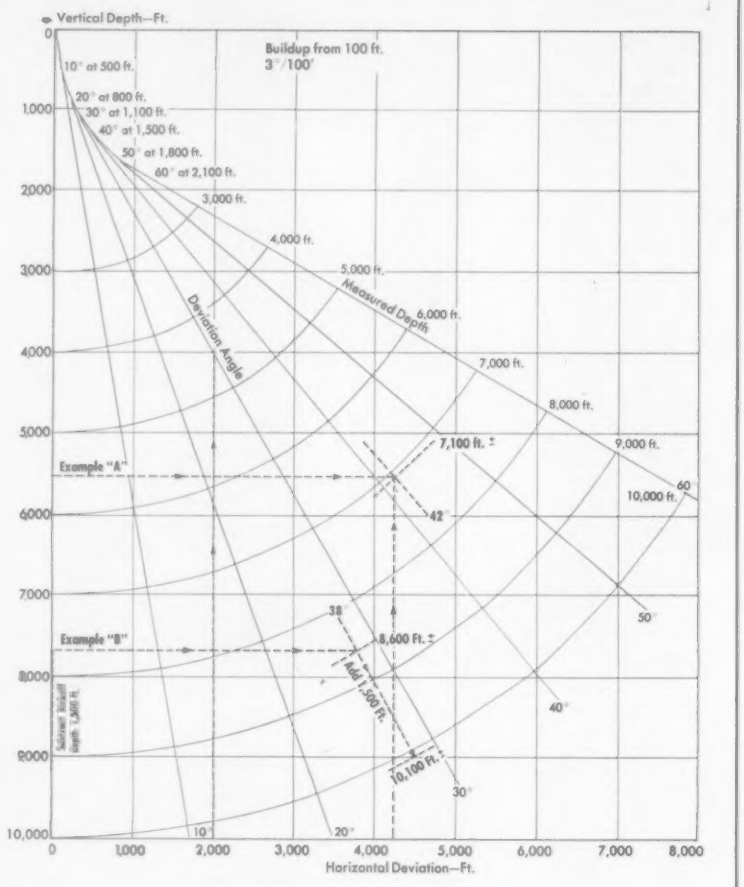
The longer operations are carried on in open hole the more conditioning of the hole will be required. Only drilling experience in a given area will tell how long the hole will stand up before serious conditions are to be expected.

Due to these conditions, the added reaming and hole conditioning represent a considerable portion of the extra cost of directional drilling. Other additional costs are the downhole surveys and services needed to direct the bit to the target depth and a generally more expensive mud-control program. Tubular costs obviously are higher since more hole is involved than in drilling a straight hole to the same depth.

More rig time also is needed on a directional well. Based on Signal's experience, it takes about 70 days to drill a 10,000-ft. hole at Cheviot Hills with a deviation of 20°. A straight hole to the same vertical depth would take only 60 days.

As an aid to estimating directional drilling costs, John LaBouff, Signal's chief petroleum engineer, has developed a chart which provides a quick estimate of the total depth of a directional hole (see box).

There is one cost advantage as far as Signal's Cheviot Hills drilling is concerned. The city requires that electric rigs be used in order to keep the noise level to a minimum. Signal is saving on its fuel bill by using the electric rig rather than a gas or diesel-powered rig, and maintenance costs on the power equipment are less than it would be on the other types of engines. Converting to electrical equipment, however, necessitated a considerable extra capital expenditure.



How to figure deviation and depth in directional drilling

For kickoff at 100 ft.:

Example "A": Target 4,250 ft. from drill site at a vertical depth of 5,500 ft. Find deviation of 4,250 ft. on lower scale and proceed upward to intersection of 5,500 ft. vertical depth line.

Answer: Deviation angle required, 42°. Drilled depth of hole ± 7,100 ft.

For kickoff at other than 100 ft.:

Example "B": Target 3,800 ft. from drill site at a vertical depth of 9,200 ft. Kickoff 1,500 ft.

Procedure: Subtract kickoff depth from vertical depth for vertical component of directed hole. Using this vertical component, assume kickoff at 100 ft. and establish required angle and drilled depth as in Example "A." Then add the depth of kickoff to obtain required drilled depth of hole.

Typical well. Standard rock bits were used in all of the wells drilled by Signal in West Los Angeles. No modifications are needed nor does any added bit wear occur. Jet bits were tried on a few occasions but did not prove advantageous.

Penetration rates in a directional well are about the same as those in the straight hole as long as drilling is not hampered by directional problems. This doesn't hold true for high-angle wells, but the rates are comparable in moderate angle holes where the deviation angle doesn't exceed 30° to 35°.

In the Cheviot Hills wells, the operator uses retrievable whipstocks which are orientated to the proper angle with bottom-hole orienting procedure and equipment. Some of the whipstocks have been the circulating type.

The first whipstock or kickoff point may vary from 500 ft. to 6,000 ft., depending on the amount of deviation required, clearance problems, and other considerations. If the deviation is small, the whipstock is set deeper in the hole than for a high-deviation well.

The wells have an average buildup angle of 3° per 100 ft. of hole, but this will vary from 2° to 5°. In order to follow the angle during the

buildup, single-shot surveys or pictures are taken every 30 to 60 ft. The surveys are taken every 90 ft. once the desired direction and deviation angle are attained.

A typical drilling program for a 10,000-ft. Cheviot Hills well with a deviation of 16° 15′ would be as follows: Drill an 18½-in. hole to about 900 ft. and cement 13⅜-in. surface casing; drill 12¼-in. and/or 10⅝-in. hole to the kickoff point; drill 10⅝-in. directional hole to casing point; run electric log and other wire-line services; cement 7-in. casing string and complete well either by perforating or with slotted liner (see diagram in page 109).

Although none of the Cheviot Hills wells have reached a deviation of 60°, Signal has found that one can expect trouble in getting wireline tools to the bottom when the angle reaches this point. There is very little success with normal wireline methods once the drift angle reaches 65°.

Signal developed a method of running electric logs in wells with a deviation angle in excess of 65° about 10 years ago in its drilling program in Huntington Beach field where many of the wells are whipstocked offshore from onshore locations.

Here is how Signal gets an electric log in these high-deviation holes:

An electric-log sonde is attached to the drill stem. Electric cable, with a connection at each end, is run inside each stand of pipe. The top section of the cable is connected to the electric-logging truck.

The drill pipe is then lowered into the hole at logging speed with the log being recorded in normal fashion. The next stand of pipe—with the electric cable inside—is then made up and lowered into the hole. Succeeding stands are added and the electric cables plugged together until the entire section has been logged.

Problems. Signal has found that directional holes have all the problems of a straight hole—then a few more of their own.

The most serious problems are keyseating, removing cuttings, drilling torque, and, in the case of high-drift-angle wells, keeping the proper weight on the bottom.

Keyseating is probably the most common problem. Since even straight holes occasionally develop key seats, Signal feels it is safe to assume that all directional wells develop key seats even though they may never become apparent.

Signal's drillers and tool pushers learned from their years of experience in Huntington Beach, Redondo Beach, and Elwood fields that the chances of the drill string sticking in a key seat can be greatly reduced by using the proper size of drill collars for the size of drill-pipe tool joint being used.

It long has been Signal's practice to use drill collars with outside diameters larger than that of the drill-pipe tool joint. They avoid using drill collars with the same o.d. as that of the tool joints.

The problems of removing drill cuttings is aggravated in the high-deviation holes. The best remedy for efficient removal is to have enough pump capacity available so that suitable drilling-fluid return velocities are available.

Signal figures an annular velocity of at least 120 ft. per minute is needed to maintain a clean hole, and a higher velocity is desirable.

The company has found that the more pumping capacity available, the fewer the problems due to cuttings and debris lying on the low side of the well.

In reducing drilling torque, the company uses a crude-oil emulsion mud with a 10% oil content. The company feels this is the best mud mixture for the West Los Angeles operations since the 10% oil content reduces torque to a satisfactory level. The company has used higher percentage crude-oil content, but found that increasing the oil content above 10% doesn't further reduce torque enough to justify the additional crude oil.

The casing program for a directed hole is much the same as for a straight hole. The vertical depth of the hole is the controlling factor in designing the string for collapse and the measured length of the hole is used in figuring tension.

Signal makes no correction in either straight or directed holes for buoyancy, compressive loading, or the component of weight lying on the lower side of the hole. Neither is the additional frictional drag in directed holes considered in casing design. The net effect by not considering these factors is an increase in the tensile safety factor of the string.

Completions. All the wells on the Signal-Richfield leases are completed with the wellheads in common production cellars.

The higher-pressure wells are equipped with downhole storm chokes and with automatic pressure-type safety valves on the flow lines. The wells are shut in instantly if there is a sudden pressure drop such as might be caused by the snapping of a wellhead or flow line.

The production facilities also are equipped with the latest automatic fire-control devices.

Each of the two leases has a lease-automatic-custody-transfer unit which will handle up to 4,500 bbl. daily. The oil is metered through the LACT facilities before moving into a nearby line.

A minimum of wellhead equipment is needed since all the wells are single completions and are flowing wells.

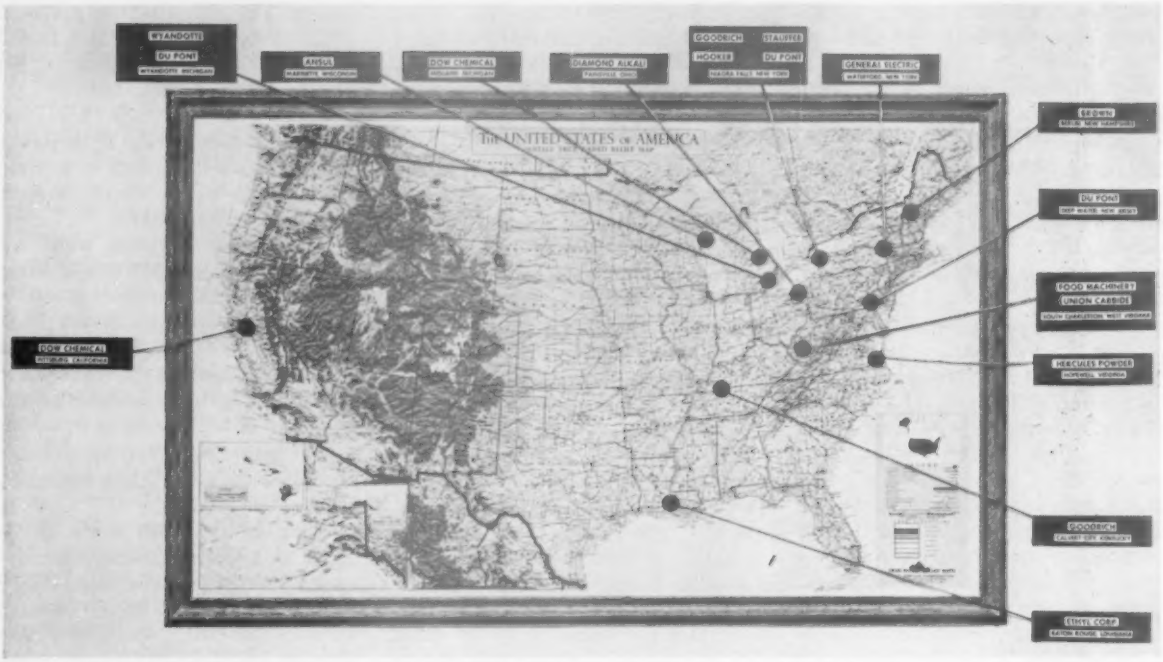
During the early development of the field, prior to installation of permanent testing and producing facilities, Signal devised a portable well-testing system which has proved so successful it has been used by other companies in Los Angeles' town-lot play.

The system consists of two traps, a scrubber, a cooling tower, a compressor, and other equipment and gages needed to test both oil and gas flow rates. In the case of the Signal wells, all gas went directly to a nearby distribution line after passing through the traps and scrubbers.

Economics. Signal feels it is saving money by operating from the two drill sites rather than from one.

If only one site were used, many of the wells would be high-deviation holes and more expensive wells. By using the two sites, the company feels the expense of the second site is covered in the savings over drilling high-deviation wells from one location.

The Signal and Richfield leases cover 5,100 acres, and there is a possibility the operator will add a third drill site before the acreage is fully developed.



PLANTS FOR MAKING CHLORINATED HYDROCARBONS were mostly centered in the northeastern part of the country up to 1940. Most of the manufacturing methods known at that time used raw materials that were more readily available in this area. Fig. 1.

Even though the source and end uses of the

Versatile chlorinated hydrocarbons

have changed considerably in the past, their growth is assured well into the future

BY R. K. TREICHLER
Dow Chemical Co.
Freeport, Tex.

CHLORINATED hydrocarbons have had an interesting history. The center of manufacture has moved from the Northeast to the Gulf Coast and back to the Northeast during the past 20 years. This migration has been due in part to the changes in technology that introduced new production techniques and raw materials. Also, end uses of these materials have varied from consumer products to raw materials for other chemicals.

Annual production of chlorinated hydrocarbons was about 3.25 million pounds in 1960, and this is expected to increase to 4.5 million pounds by 1970.

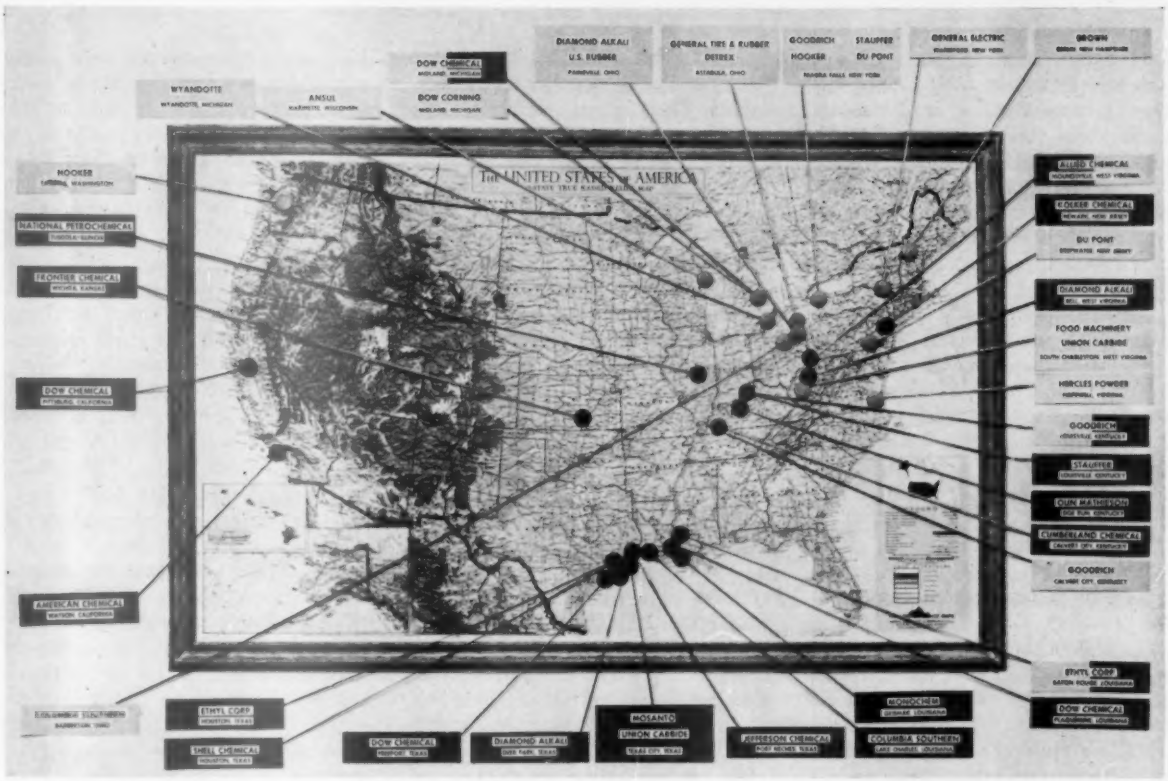
The ethylene and propylene glycol families have not been considered in this report even though the chlorhydrin process is still a major source of glycol production.

Presented at forty-fourth national meeting of AIChE, New Orleans.

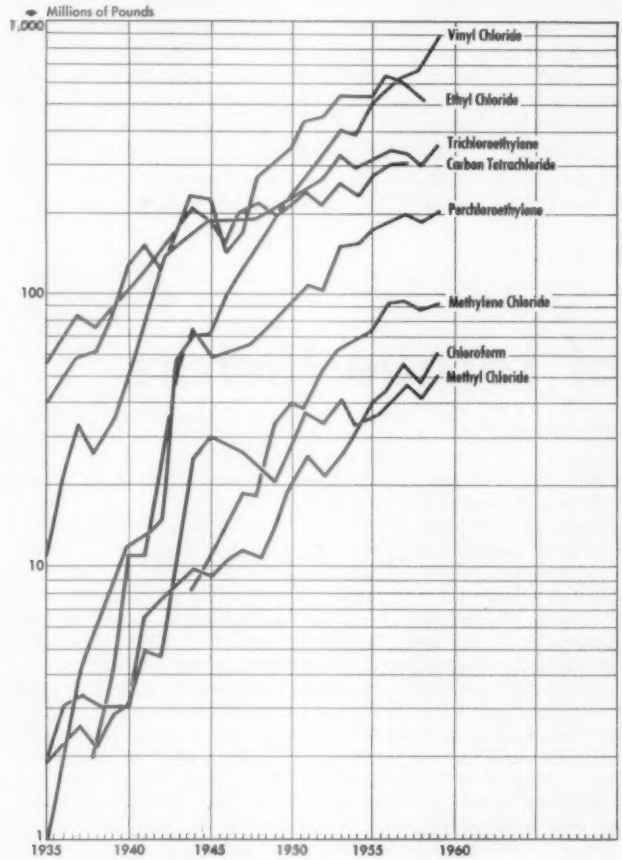
Past Production. Over the years, uses for chlorinated hydrocarbons have varied by a very wide range. Some products such as carbon tetrachloride and chloroform are used mostly today as raw materials for production of other compounds, while they were originally introduced as cleaning fluids, dry cleaners, pharmaceuticals, etc. Other products such as ethyl chloride have a very questionable future since the advent of tetramethyl lead as antiknock fluid in gasolines. Also, a new process has been developed using organic aluminums to produce tetraethyl lead compound.

Despite a lot of predictions each year that production of these individual products just has to drop off because the market is saturated, and so forth, you can see in Fig. 3 that ethyl chloride is the only product, through 1959, that shows a definite downtrend. To date, it seems that new uses for each of the other chlorinated hydrocarbon products appear, requiring a higher production rate than some subsequent loss due to obsolesence.

Plant locations. By 1940, the total U. S. capacity for production of chlorinated hydrocarbons was made up of 18 major plant sites in 13 cities, as shown in Fig. 1. Of these,

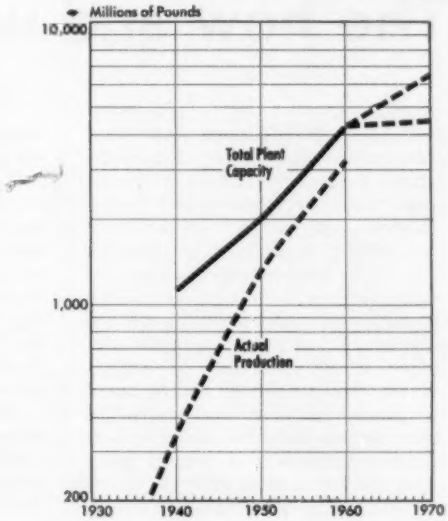


LOCATION OF PLANTS has been trending toward the Gulf Coast since the introduction of new production techniques based on natural gas and petroleum-derived raw materials. Fig. 2.



PRODUCTION of chlorinated hydrocarbons has grown steadily in the U. S. since the manufacture of carbon tetrachloride began in 1902. Fig. 3.

FUTURE PRODUCTION of chlorinated hydrocarbons is estimated at 4.5 million pounds per year in 1970. This is an increase of 1.3 million pounds over 1960. Fig. 4.



only Ethyl Corp. in Baton Rouge was located on the Gulf Coast. The Dow Chemical plant in Pittsburg, Calif., was the only plant at this time producing chlorinated hydrocarbons from natural gas-based raw material. All the other production was based on alcohols, calcium carbide-based acetylene, carbon disulfide, and the like.

By 1950, the total number of plant sites increased to 27 in 20 cities, with the major growth being on the Gulf Coast. Abundant fuel, plentiful LPG feed stock, numerous salt domes on the Gulf Coast, and availability of water transportation to the customer attracted this business.

By 1960, the number of plant sites increased to 40 in 28 cities. This growth resulted for three major reasons:

1. Use of methane as a raw material in the Ohio River area.

2. Expansion of vinyl chloride capacity in the Ohio River area by installing thermal cracking facilities to dehydrochlorinate ethylene dichloride to vinyl chloride and anhydrous hydrochloric acid.

3. Installation of acetylene-hydrochloric acid facilities for the production of vinyl chloride in localities where existing plants were modernizing their trichloroethylene facilities. This made a byproduct of anhydrous hydrochloric acid, rather than essentially throwing it away by cracking the tetrachloroethanes with lime. Notable examples of this are General Tire & Rubber Co.'s Ashtabula, Ohio, plant, which gets its anhydrous hydrochloric acid from Detrex's trichloroethylene facilities also in Ashtabula, and Goodrich's Louisville, Ky., plant, which installed thermal cracking facilities to balance the older acetylene-HCl facilities for the production of vinyl chloride.

Today, there are some 44 major plant locations in the U. S. in 31 cities producing chlorinated hydrocarbons. In 1960, production from these installations, shown in Fig. 2, was in the neighborhood of 3,250,000,000 lb.

Production capacity of chlorinated hydrocarbons is shown in Fig. 4. The top line includes some plant capacity which is in standby condition only. It includes other plants that probably never will be run at design capacity again, because cheaper raw materials are available to produce the product more economically. The second curve is a plot of the actual production of chlorinated hydrocarbons over the same period as the top curve.

The 1970 point is dotted, showing what could happen in the way of anual plant capacity, and showing what has already been announced in the way of increased capacities for 1970. The lower lotted line include Columbia Southern's 100,000,000-lb. per year ethylene dichloride plant in the Lake Charles, La., area; Monochem's announced plans for a 150,000,000-lb. per year vinyl chloride installation at Geismar, La.; and Olin Mathieson's new glycerine plant at Doe Run, Ky. Another project, announced last summer, is Diamond Alkali's multimillion-dollar expansion in Deer Park, Tex., to increase its vinyl chloride production from 50 to 75 million pounds per year, and manufacture the acetylene requirements from natural gas.

Future. Indications are that the future holds a great deal in store for the chlorinated hydrocarbon industry. Certainly some of the products will eventually fall by the wayside and others will have their production rate level off. But, as an example of these products which still have tremendous growth prospects, we have allyl chloride, expanding because of the epoxy-resin business and the emphasis presently being placed on glycerine based polyurethene and polyester resins. The new acrolein process for the production of glycerine will not slow these products' growth rate by the present chlorine route very much. The high polymers of fluorocarbons such as Kel F and Telflon are just getting started. These, of course, are based on chlorinated hydrocarbons. The use of vinyl chloride in this country for structural and building materials is way behind its use in England and Germany, but it will be catching up quickly.

OIL-WELL PUMPING
PART 34

The how and why of torque factors

BY JOSEPH ZABA

DYNAMOMETER cards have been presented showing effect of counterbalance changes on polished-rod horsepower and peak polished-rod loads.[1] Indirectly, change of counterbalance may affect plunger travel and production. The fundamental purpose of counterbalance is to equalize net torque on the reducer during up and downstroke portions of the cycle. Net torque is the resultant of torques created by net well load and by counterbalance. Net well load equals the instantaneous well load, less the beam balance, if one is used, less the unit's beam offbalance (Part 9).

Determining counterbalance conditions of a beam pumping unit from the point of view of torque conditions reduces itself to construction of torque curves, Fig. 43. These suggest the changes needed to improve balance conditions, to make the torques approximately equal during the up and downstroke. Dynamometer cards are used to determine the loads involved. An approximate method of arriving at the torque curves from dynamometer cards assumes that crank motion is uniform and that the load at the wrist pin is always vertical.[2] It has been pointed out, however, that under certain conditions, this method may result in serious errors.[3] Several more accurate methods have been developed.

J. L. Laudermilk offered a graphic method of torque determination.[4] An accurate line drawing of the unit under investigation is made to scale and the scaled-down length of polished-rod stroke is found from the drawing. Any given position of the wrist pin can now be traced through the unit to the corresponding position of the polished rod which permits reading the well load at that point from the dynamometer card. The load is laid off along the pitman, using any selected scale, and is resolved into two components.

The component vertical to the crank gives the magnitude of the well load creating the torque. The magnitude of the torque due to balance weights, is found by laying out a weight vector vertically downward from the point of action of the weights, resolving it into two components and multiplying the component vertical to the crank by the lever arm. By repeating the procedure for a number of crank positions the torque curves may be constructed. Fig. 44 shows the method for one position of the crank.

Emory N. Kemler offered a method in which instantaneous power requirements are determined as a product of instantaneous velocities and instantaneous loads.[2] The polished-load velocity is determined by vector method from crank-pin velocity and the line layout of the unit. The instantaneous power is a product of velocity and the corresponding load, found from the dynamometer card. Torque is calculated from relationship between power and torque. Kenneth N. Mills presented a formula for calculation of torques from dynamometer card for the given geometrical layout of the unit.[5]

D. O. Johnson developed the method of determining the net torque which automatically takes into consideration the geometry of the unit.[6] The method consists of recording the timing wave simultaneously with dynamometer card. This permits plotting polished-rod velocity and polished-rod-load-against-time curves. The product of velocity and load at any point gives instantaneous horsepower. The crank speed is found with a recording tachometer. For any given crank position, torque is proportional to the horsepower divided by crank speed.

Torque Factors

All these methods of finding torque on a reducer are time consuming. The method now used most frequently employs the concept of the so-called "torque factors" which permit direct conversion of the polished-rod load to torque. To find net torque on the reducer it is then only necessary to subtract from this torque the torque exerted by the counterbalance weights. D. O. Johnson described the manner of determining the torque factors and their application.[7]

More recently, a special task group of the API Subcommittee on Pumping Units prepared a text on calculation and application of torque factors, which after ballot approval by the appropriate committees will be published soon in an API Bulletin of Recommended Practices.

The torque factor is defined as that factor which, multiplied by load in pounds at the polished rod, gives the torque in inch-pounds at the crankshaft of the pumping unit reducer.

The API Standard 11-E, March 1960 "API Specification for Pumping Units" provides that for determination of torque from dynamometer data the manufacturers ". . . shall provide, on request of the purchaser, stroke and torque factors for each 15° position of the crank." The form, approved by the standard for these data, requires two items for each 15° of crank travel, measured clockwise from the 12 o'clock position with wellhead to the right: (1) position of rods expressed as a fraction of stroke above the lowermost position, and (2) the corresponding torque factors.

This is for clockwise rotation of the crank. For counterclockwise rotation the data for rod position and torque factors remain unchanged but the table is read from the bottom up. That means that the 15° position of the crank is at the bottom and increases in 15° increments toward the top.

Determining torque factors for a given unit involves a lot of work on the part of the manufacturer. The angles involved are either measured from a scale layout or they are calculated mathematically. Once determined the factors are used either for analysis of performance of existing installation or for calculation of a new installation.

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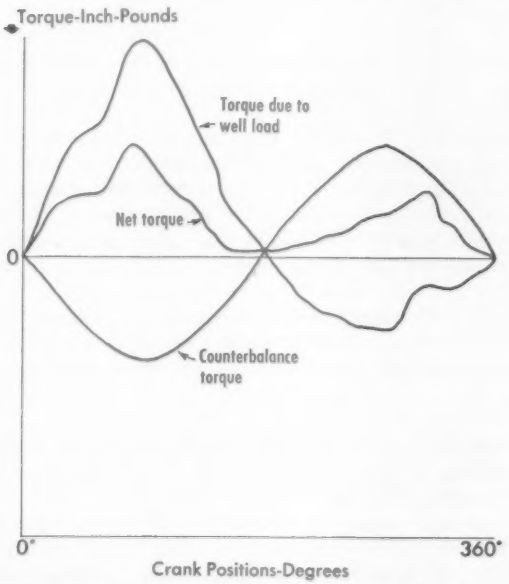
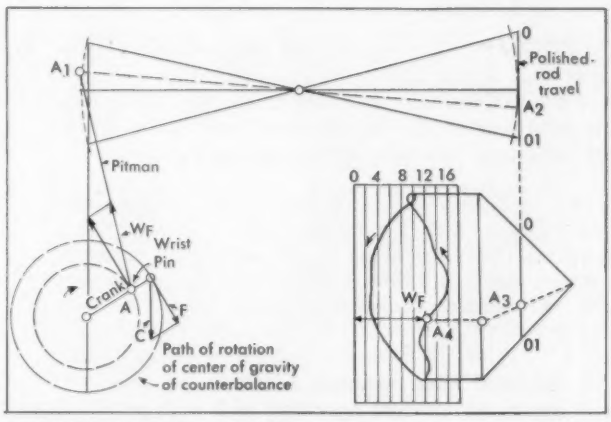


PERFECT BALANCE is obtained only when the torque due to well load and the counterbalance torque are equal and opposite. Result would be a net torque with a constant zero value. Fig. 43.



GRAPHICAL METHOD of finding torque uses a scaled drawing of the unit geometry. Details for finding torque at one crank position are shown here. Fig. 44.

WPRA refining panel tackles tough

About the panel...

Each year refiners from all over the country gather in El Dorado to pose their mutual refining problems to a panel of experts. Here's the first of a series of articles which will bring you portions of what was discussed. Panel members are: F. W. Kopf, Atlantic Refining Co., Philadelphia; L. B. Parks, Continental Oil Co., Ponca City; D. P. Handke, Standard Oil Co. (Ohio), Cleveland; R. M. Brown, Union Oil Co. of California, Wilmington, Calif.; W. L. Banks, technical director of WPRA, Tulsa (panel moderator); O. P. Doyle, Ingram Oil & Refining Co., Chalmette, La.; A. C. Patterson, Esso Research & Engineering Co., Linden, N. J.; T. J. Oleszko, Aurora Gasoline Co., Detroit; J. A. Gearhart, American Petrofina Co. of Texas, Mount Pleasant, Tex.; and J. A. Brooks, American Oil Co., Whiting, Ind.

PART 1 OF A SERIES

General

BANKS: What factors can be used to maximize isobutane production in the refinery?

HANDKE: As far as Sohio is concerned, we do as complete a recovery as we can in our gas plant. The only other area of control over and above that is the way we operate our cat crackers. We try to optimize the production of isobutanes, over and above the production of olefins.

PATTERSON: I could add the rather obvious comment that if you install a C_4 isomerization unit you will certainly increase isobutane production. Of course, cat reforming conditions also contribute. More severe cat reforming produces more isobutane.

KOPF: A reforming catalyst with a silica-alumina base will produce, with a constant severity, about 2.0-2.5 times as much isobutane as an all-alumina-base reforming catalyst. There is more total C_4 production, and the concentration of isobutane in the C_4's is higher.

BANKS: What operating conditions are necessary for efficient operation with high propylene contents?

BROOKS: According to a survey made this year by Standard Oil Co. (Ind.), about 15% of the alkylation units have processed C_3 olefins. Three of these are in Standard Oil Co.

I have no comment on C_4 olefins, but our survey indicated six refineries have reported processing C_5 olefins. None of these are in Standard Oil Co.

GEARHART: In our Mt. Pleasant, Tex., refinery, we have a preponderance of propylene in the cat cracker light-ends production. I recently looked over the past 2 years' operations which indicated a ratio of 55% propylenes and 45% butylenes (mole per cent) in fresh feed to the HF alkylation unit.

BROOKS: Our survey indicated that one jet-contacting alkylation unit is processing 45% propylene. One cascade unit and three Stratco units were processing more than 45% propylene.

GEARHART: With a high-propylene-content feed, we operate in the range of 10:1 to 12:1 isobutane-to-olefin ratio. The 6-lb. R.v.p. alkylate product has a clear research octane of about 93.5 and an end point of about 365° F. This is the full-boiling-range alkylate.

The high isobutane-to-olefin ratio seems to have a marked effect on alkylate quality. Propylene alkylate is normally lower in quality than either butylene or amylene alkylate. But by maintaining a high isobu-

problems in field of alkylation

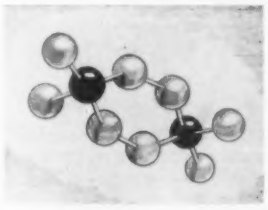
tane-to-olefin ratio, this can be overcome somewhat, at well as reducing production of acid-soluble oils.

BANKS: What is the effect on F-1-0 and F-4-4.6 octane when 90% point of light alkylate is changed?

BROWN: End point makes very little difference there, but seems to be about 0.04 of a performance number with our plant for each degree 90%-point change on the Engler.

HF alkylation

BANKS: How effective is the removal of HF from propane in the propane stripper in HF alkylation. Is further treatment required with bauxite or caustic to remove or neutralize the acid?



BROOKS: At the Mandan alkylation unit the propane stripper has generally been effective in removing HF from the propane. Further treatment is required to remove these traces of HF and also act as a guard in times of emergency when the stripper may malfunction or be out of service. At Mandan we have a caustic wash followed by a sand-tower coalescer and bauxite dryers. It is necessary to change this caustic only about every 3 months.

BANKS: What is the maximum limit of combined fluorides that can be tolerated in propane for LPG sales and what can be done to reduce combined fluorides in propane produced HF alkylation?

GEARHART: I recall having seen somewhere in the literature a range of from .002 to .003 wt. %.

H. A. McCANDLESS (American Oil Co., El Dorado, Ark.): I have seen a number in the order of 100 p.p.m., to prevent burner-tip fouling, etc. That's for combined fluoride, and I think it can be removed by bauxite treating.

T. B. RANDALL (Midland Cooperatives, Inc., Cushing, Okla.): I can assure you the gas industry is going to insist on 30 p.p.m. The source is one of the largest firms hauling LPG, and that is what their answer is. They seem to base it on some pretty solid information.

NASSER: Does anybody care to comment upon the effects of mercaptan in propylene HF alkylation—what the effects on acid consumption would be?

L. R. REINKEMEYER (Anderson-Prichard Oil Corp., Arkansas City, Kan.): We operate a UOP HF alkylation unit on mixed feed; namely, propylene, butylene and some amylenes. This feed has very high H_2S and mercaptans in the range of 50 to 85 grains per 100 cu. ft. The feed is produced as a bottom product off the deethanizer and goes direct to the HF unit without any treatment for removal of these sulfur compounds.

Acid consumption is around 0.3 lb. per bbl. of alkylate produced. There appears to be some other problems stemming from the high sulfur feed such as corrosion and fluorides in the propane. Also, more acid tar will be produced which complicates a disposal problem.

F. J. BAIRD (Derby Refining Co., Wichita): There was some discussion about the optimum strength for sulfuric acid. I'm wondering if there is some experience for optimum acid strength on HF alkylation?

HARRY deLOOPER (Texas City Refining, Inc., Texas City): When we get below 86% we find we get into trouble, so we try to operate in the range of 88 to 92%.

REINKEMEYER: I've heard some rumors about people who were working on this. They actually shut the regenerator down for some time to let the strength

of the acid go down for the purpose of watching the octane. They did find, at a lower strength, an increase in octane. We run with an acid strength of 87 to 89% and the octane normally is 93.5 to 94.0 octane clear.

deLOOPER: If we get below 86% we tend to polymerize and our fluorides increase rapidly. If we deliberately shut our regenerator down for a period of time we would get into serious trouble. Whenever we have trouble with our regenerator we reduce our feed almost immediately.

JOHN ANDERSON (Cooperative Refinery Association, Coffeyville, Kans.): We've had some experience with regenerators out of operation. We have gone from 2 to 3 days with our regenerator down, and our acid strength has been as low as 86%. But we've actually had increases in octane numbers. At 92% we would be around 95 octane, and down around 86% would be 96.5 octane.

McCANDLESS: Since we're passing rumors, I'll just pass one along. My impression, some time ago, in talking with a licensor, was that they believe 94% is a desirable HF acid concentration, on the theory that butene-1 isomerizes. Therefore you obtain octane improvement through that route.

BAIRD: There was a comment made about combined fluorides increasing as acid strength decreases. Is there any further elaboration or further data on this?

deLOOPER: Yes, the data are available. If you desire we can send it to you. We have found that if acid strength is 86% or above, fluorides are in the range of 0.015 to 0.018%. When acid strength drops below 86%, the fluorides increase, even double in a very short time. We pump fresh acid to bring that strength up, and in about 2 or 3 hours we find that fluorides have dropped right back down. To us, this is definitely the thing to do.

McCANDLESS: I believe that our experience will also bear out that same trend.

RANDALL: We have a new alkylation plant and it could be Reinkemeyer was referring to our plant. We operate our regenerator about 2 days out of 2 weeks for an average. We have a lot of problems, and we don't have the answers concerning fluorides, combined fluorides, and such, as yet. But if we get any further information we will be glad to send it along.

We have a peculiar situation in that our regenerator is just too good, our feed stocks too dry, and we have run into this problem where we were continually up about 97% acid strength. The only way we could get it down was to shut our regenerator down.

CHAMBERLAIN (Texas City Refining, Inc., Texas City): In regard to combined fluorides, I have heard that the amount of isobutane coming out of the bottom of the deiso tower may be an indication of fluoride content due to the inclusion of isobutyl fluoride. I was wondering if anyone had any comment on that?

REINKEMEYER: We have been told that combined fluorides in the propane stream will be minimized with minimum residue or minimum isobutane. This is supposedly due to the isopropyl fluoride that boils in the isobutane boiling range. It should be refluxed back down the tower. We attempt to do this on the HF-unit depropanizer but the propane still contains 60 to 100 p.p.m. combined fluorides. I might add that we have had some complaints on this propane due to fluorides.

Going back just a moment to acid strength, it is possible for the acid to leave the contactor if the strength gets below 86%. The acid wants to stay in the settler. Under conditions where the acid is out of the contactor, there is definitely a lot of fluorides made along with brown alkylate and increased amounts of acid tar. I am sure you will find very high combined fluorides in the propane under these abnormal conditions.

Sulfuric acid alkylation

BANKS: Both favorable and unfavorable comments have been made concerning hot water wash of reactor effluent from sulfuric-acid alkylation. Are those that are using it finding the expected reduction in tower fouling and corrosion?

OLESZKO: I can make a negative comment here. Our alkylation unit has only been on stream a little over 6 months. We are set up for both hot water and cold water; however, we have been using a cold-water wash. We have not experienced any problems in subsequent equipment.

PATTERSON: This doesn't become a problem if operating conditions are correct on the alkylation unit. And one of the most important things in this regard is to prevent gross contact between olefins and acid. If you succeed in getting them properly dispersed, the formation of esters should be minimized, and neither hot or cold-water wash should be necessary.

Having said all this, perhaps I should admit that we have had this kind of trouble in some of our own plants. We have found that hot-water washing has indeed got us out of this trouble. In one particular instance a tower was very badly corroded in a matter of a few weeks. We instituted hot-water washing and corrected this condition.

HANDKE: We have tried both hot-water washing and caustic washing, and I think our experience points up what Pat (Patterson) has said. Either one will do a good job, but the primary factor is the condition of the alkylation reaction and the contaminants that are there. If you can control these in the proper manner, then either hot-water washing or caustic washing will protect downstream equipment from corrosion.

PARKS: At our Lake Charles plant, we have been using a hot-water wash for over a year now, and have found a substantial reduction in the amount of corrosion and fouling in the down stream towers and reboilers.

J. W. DALLMAN (International Refineries, Inc., Wrenshall, Minn.): I would like to know how hot is hot?

PARKS: In our case it is about 140° F.

KOPF: At Atlantic we have raised both the caustic wash and the water wash about 30° F. and find that is effective.

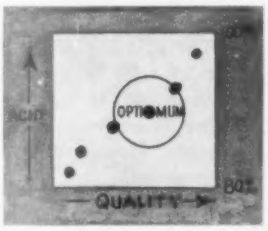
BANKS: What is the optimum acid strength for minimizing acid usage for butenes and propylenes in sulfuric acid alkylation?

BROOKS: Our alkylation people made the following comment on this question: "As low as possible short of acid runaway, which has been variously reported to occur from 80 to 88%."

HANDKE: We don't have a lot of what we would call good data to support it, but we feel that somewhere around 90% is probably optimum.

KOPF: In considering the question of minimum per cent acid, you must also consider the allied questions of the cost of the acid to you and the octane effect that you get by raising the acid strength. Based on Stratco published data we would calculate about a 92% optimum point, considering all those factors. We actually operate our Stratco unit at 89%.

On the other end, we have a somewhat unusual situation in that we have three types of alkylation units, a Stratco, a Cascade, and an old time-tank unit. We operate the Cascade and the time-tank units in series on acid. We take the acid down in the Cascade unit to about 94%. From there it goes to the time-tank unit and leaves it at about 90 to 91%. We consider that over-all situation as being optimum.



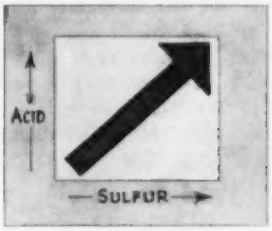
PARKS: We also operate with a Stratco and a Cascade in series. I wondered, in your operation, if you have found any difference in the reverse of that order. We have been asked at times to reverse the order, at least for a trial, having the acid at a higher strength in the Cascade and going to the Stratco with it, instead of the way we have it now. I wondered if there is any difference noted, or if you had tried reversing your additive flow.

KOPF: Marv, we don't have the Stratco in this system. We have the Cascade, followed by the time-tank unit, and we have never reversed them.

BROWN: We have an old unit, 1943 vintage. We regressed data taken over a 3-year period when acid strength ranged from 90 to 92%. We could find no correlation of acid strength in that range with these data. Incidentally, that gave us approximately a 95% oil-free basis.

About a year ago we decided to start looking at an oil-free basis all the time, and we lowered the oil-free basis from 95 to 93%. The titratable on the total is down to about 87%. So far we can't seem to find any effect in the plant, although I am sure there is some quality loss. The output is being used in motor gasoline for the most part, so the quality loss isn't too significant to us.

BANKS: What quantity of acid is used by mercaptan sulfur in feed streams to sulfuric acid alkylation? Does the reaction proceed to the disulfide?



PATTERSON: How much acid is used by mercaptan sulfur depends on how far the reaction goes, of course. It could stop at the disulfide or it could form oxygen-containing materials. If you assume that it goes to the disulfide you can calculate that the consumption would be in the order of 140 lb. per gal. of mercaptan to hold acid concentration constant, or 240 lb. per gal. of mercaptan to hold water content constant. These are calculated figures.

In actual operation we have seen numbers as high as 500 lb. per gal. of mercaptan reported from commercial units. This is simply the amount of H_2SO_4 that reacts with (2) CH_3SH to form $CH_3\text{-}S\text{-}CH_3 + 2H_2O + SO_2$.

KOPF: We came up with about 67 lb. of acid per 1 lb. of mercaptan sulfur. This assumes that acid is changing from 98% fresh to 90% spent concentration. The other part of that question is whether it proceeded to the disulfide and we think it does. Just as a matter of interest, we think the disulfide would be 100% soluble in 93% acid. With 90% acid in the system some part of the disulfide would go into the hydrocarbon phase.

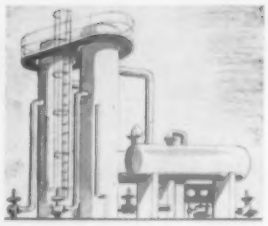
BROOKS: From early TAC reports we estimated consumption of 63 lb. of acid (98 to 92% in strength) per pound of mercaptan sulfur. However, we have no data of our own.

BANKS: Has anyone installed coalescers or driers on the feed to a sulfuric-acid alkylation unit and what were the results?

BROOKS: We don't have any profound information on this subject. We have coalescers in several locations, and in general, we did not consider them satisfactory for removing entrained water. However, we think part of our problem has been analytical as well as operational.

We don't really know how much water we removed

in earlier operations, and we are currently in an intensive study on the application of coalescers on alkylation units. Our commercial unit which is currently under construction at Whiting will have a coalescer on it to remove entrained water from the butane feed.



HANDKE: Our comment is similar. We have coalescers and we have had use of them when we've had slugs of water in our feed. They are located after the feed chillers. I think obviously they will take out slugs of water. Therefore if there is a chance of your getting slugs of water, they're probably a good thing to have.

As far as just normal water takeoff, we don't have that. We don't feel that they are really necessary in that area. But they do take out slugs. We get slugs, so we put them on.

KOPF: We have a coalescer on the isobutane and also on the feed BB. We put the coalescer at a point in the system after the BB has been chilled down. The BB is caustic and water-washed before coming to the unit. It is saturated at conditions leaving the water wash, and then as it is chilled down the water will come out of solution.

We find the efficiency of the coalescer is about 50 to 75% in removing water. We figure this on the basis of saturation taking place in the washing and that the coalescer is separating out the water which comes out of solution at the lower temperature.

F. FORMWAY (Sinclair Refining Co., Houston): I would like to find out what method these people use for analyzing water, to know how effective the removal is?

KOPF: I don't believe we use any analytical method. We assume that the material is saturated leaving the water wash, which I think is a reasonable assumption. Data are available for the water content under that situation. Then we actually measure, roughly, the amount of water which we drain out after the coalescer. That's how we got the figures I was talking about.

J. NASSER (Socony Mobil Oil Co., New York): Has anybody had experience with the use of dryers on the feed to a sulfuric acid or a HF unit, or the isobutane recycle in a sulfuric-acid unit?

BROWN: On the BB stream we have a sand filter, followed by a Porocel dryer. We seem to operate at about 35 p.pm. with this equipment. Porocel driers on the isomerization plant feed give us about 2 p.p.m.

GEARHART: We have an HF unit and use fractionation drying on the fresh feed and charge isobutane that we purchase to this drying column also. Of course, isobutane recycle within the unit is already dry. Following the fractionating dryer we have two chambers containing silica gel which can be alternated in service and regenerated.

As additional insurance, we have a moisture monitor on the feed with a continuous-strip-chart recorder mounted on the control board. We operate within the range of 0 to 30 p.p.m. of water. This moisture monitor is produced commercially by Consolidated, and it has worked very satisfactorily now for 2 years.

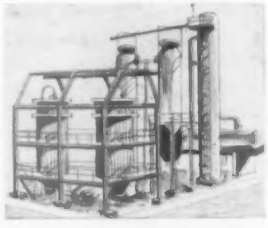
REINKEMEYER: We have used one of the moisture monitors on several occasions on some olefin feed to the HF alkylation unit. This feed happens to be dried in bauxite dryers with some of the outside isobutane and feed. The monitor does not function too well on light hydrocarbons that contain olefins. The phosphorous pentoxide coating on the electrolysis cell will polymerize the olefins and become inactive in time.

It is possible to get a reading before this happens, providing the reading is taken as quickly as possible after equilibrium conditions are reached in the sample lines and the monitor. We believe that the P_2O_5 coating will polymerize the olefins in time and thereby become inactive and give false readings of the actual water content. Moisture monitors have been used successfully on hydrogen recycle gases.

GEARHART: I would like to comment further on what Bob (Reinkemeyer) was saying in that we haven't experienced this difficulty. The instrument responds to any upset in the water wash or fractionation system ahead of the dessicant drying equipment by an increased reading on the moisture monitor.

We have the instrument equipped with an alarm system. When the moisture content approaches 30 p.p.m., it sounds an alarm that alerts the operator to switch drying chambers.

BANKS: Do all refiners operate alkylation units with a homogeneous acid-continuous emulsion? If not, what operational changes can be made to insure that such an emulsion exists? How does one determine the nature of emulsion?



HANDKE: Kellogg reactors operate with an acid-in-hydrocarbon emulsion while the Stratco units operate with acid as a continuous phase. Increased horsepower to the mixers may give the phase change, but a change in the mixing device may be necessary to put a greater percentage of the power input to shear rather than circulation.

The nature of the emulsion is easily determined by withdrawing a sample of the emulsion. If it is frothy and settles quickly, it is acid in hydrocarbon. If it is of mayonnaise consistency and takes from 20 to 30 minutes to break, it is hydrocarbon in acid.

R. K. McCORD (Aurora Gasoline Co., Detroit): We

haven't too much information from our unit, because it has only been running 6 months. Ours is a Stratco unit and we run with our acid-recycle valve wide open. We have found that an acid-to-hydrocarbon ratio of about 35% gives us our best quality alkylate. In going up to 45 and 50% the quality is lowered. Also I might add that going below 30% seems to lower the quality also. We obtained these data at roughly the same charge rate.

BANKS: How much does butylene-alkylate quality and acid consumption vary with changes in acid discard strength?

PATTERSON: Our data indicate that octane drops roughly 0.1-0.3 points per per cent drop in acid strength.

HANDKE: It just depends on where you stand in relation to the temperatures, the isoolefin ratio, and some of the other variables. But if any of the prime variables are borderline, then we find that a high acid-type will probably help the quality. Now, in our plants, we are striving to maintain a maximum of 40° temperature and 60% isobutane in the effluent. We can tell no difference, qualitywise, and little difference in the acid consumption between running at 89 and 93% acid strength on the acid itself.

KOPF: We use about 0.15 research octane number clear per weight per cent change in acid strength in the 90-94% range. We feel octane change is a little smaller above that range and greater below that range. The other part of this question concerns the consumption of acid. Using 99% fresh acid, we calculate a 12% increase in acid consumption going from 90 to 92%, a 25% increase going from 92 to 94%, and then a very rapid increase going from 94% on up.

BANKS: How much degradation of C_8 hydrocarbon occurs in a sulfuric acid alkylation unit?

HANDKE: From laboratory experiments we have seen that pure isooctane can be degraded by about 25 vol. % by continual agitation with strong sulfuric acid. Experiments to ascertain this in the plant have not been particularly successful, but we do believe the degradation has been minimized by having a rich atmosphere of isobutane in the system. We try to keep above 60% isobutane in the effluent and we feel this helps retard, in some degree, the degradation of the actual octane in the system.

PATTERSON: We have wondered about this question. We haven't been able to detect any degradation of the alkylate once it is formed, and therefore we are dubious that there is any.

BANKS: What methods of pH control have proved satisfactory on DIB overhead systems? How is the pH monitored if the system is almost dry?

KOPF: We manually sample water from the reflux drum and measure pH once each shift. It is controlled to a 7 pH by the injection of diethanolamine. This setup works well to control corrosion.

OLESZKO: We haven't had to control the pH, following a caustic wash. However, we monitor the corrosion with the corrosometer probe.

BROOKS: What do you do when you find corrosion?

OLESZKO: We haven't had to cross that bridge yet. Therefore, I made the note on my sheet, "Use DEA."

BROWN: We have a reasonably dry system, but we do get some water overhead, and withdraw it only intermittently. We check pH every time before withdrawal. Caustic is added for control.

PARKS: We simply check the overhead water pH occasionally using indicating paper. It normally runs between 5 and 7 so that no control is necessary. We do add a corrosion inhibitor.

BANKS: What is considered the optimum acid recirculation rate on cascade-type sulfuric alkylation units?

HANDKE: We've seen no particular effect in the 30 to 50 g.p.m. range, but we're going to investigate up in the range of 200 to 300 g.p.m.

KOPF: We don't believe we know anything about an optimum. We circulate the maximum consistent with little or no hydrocarbon carryover into the acid-recycle stream. We actually run the acid recycle about 2,200 bbl. per day and this is a 4,000 bbl. per day cascade-type unit. Reactor effluent is about 17,000 bbl. per day.

BANKS: What techniques are being used to obtain accurate and reproducible acidic content of used alkylation acid?

HANDKE: We are using a Hallikainen acid analyzer on our spent-acid stream. We feel the results we've been getting from this are pretty good. The other technique for getting accurate and reproducible acidic content is to have good control-lab operators. They will get you good answers.

PATTERSON: Our analytical people tell me that there was something of a classic published in Analytical Chemistry, Vol. 25, p. 277, 1953. It was called "Analysis of H_2SO_4 and Acid Sludges from Petroleum Processes." It was written by Weiss, et al. We analyze for total acidity and titratable acidity and what we call free acid. All of these analytical methods are based on this article by Weiss.

RAY PARKER (Rock Island Refining Co., Indianapolis): At Texas Co., Wilmington, we used a Hallikainen gravitometer on the acid. For some reason, either justifiable or not, the operators lost confidence in the instrument and we relied more on laboratory results. Therefore, the instrument, while useful, became a secondary control rather than a primary control.

Build accident prevention into your safety program

BY JAMES H. HERBERT
Consultant,
Accident and Fire Prevention
Greenwich, Conn.

THE WORD, ACCIDENT, is used only because of popular use of the word. There are few if any accidents. How many times do we hear people refer, for example, to highway accidents? The facts generally indicate that a driver did something which he should not have done, or did not maintain his car in proper repair. An accident is an unexpected happening. Certainly, an automobile crash brought about by high speed or resulting from faulty brakes scarcely comes under the heading of an unexpected happening.

Most industrial injuries or fires do not come under the heading of unexpected happenings. They may be classified as unexpected only from the standpoint that people were not aware of the facts prior to the incident. Study generally shows that the stage was set for trouble. The great need, then, is to see that automatic procedures are established to warn of impending critical conditions.

It is true that some equipment fails after all known safety precautions have been taken. This, indeed, is an accident.

If jobs are properly planned and, then, if the well-developed plans are followed, people will not be injured, and fires, explosions, and property damage will not occur. The following of well-developed plans must, however, be formalized. Often foolproof procedures are worked out, but someone forgets to follow them. We err mostly on the human fault of forgetting.

We are all guilty of thinking that we are safe in whatever we do, and that it is the other fellow who is careless and does not think. Unfortunately, we are the other fellow too often.

Practices referred to in these questions will help to prevent trouble and will improve operating efficiencies.

10. Are there formal written approvals for repetitive activities such as:

(a) Maintenance-department personnel working on operating equipment. Many deaths, injuries, and serious fires have resulted from lack of proper approval before work commences.

(b) Possible exposure to toxic materials including radioactive matter. Exposure to such hazards is far too serious today to leave to chance or judgment of the moment. Tight formalities are required to make a person think before he takes a step where he may be subject to such exposure.

(c) Entering vessels. We are constantly reading about men who lose their lives because of entry into unsafe vessels.

(d) Burning and welding in questionable areas. More progress has probably been made in this activity than in any other to try to formalize safety checks. Even so, we often read of serious fires and explosions being caused by careless use of torches and welding equipment.

(e) Blinding and plugging. During unit turnarounds or repairs on all types of oil-industry equipment, greater attention on a formal, written basis is being paid to the blinding or plugging of lines and vessels.

End of five-part series. Parts 1, 2, 3, and 4 of this series appeared February 6, 13, 20, and 27.

"Securing written approvals before action can take place is not positive proof that a misfortune will not occur; however, people will rarely give written approval unless they are positive that a given set of circumstances exists."

Decisions are made far in advance as to just exactly which lines or vessels are to be sealed off.

Lists are made designating the locations. Space is provided for the person who installs the blind to write his initials to attest to the fact that he did it. The same applies to the person who removes the blind. In some cases there is space for another and even two other people to confirm the fact.

This procedure, rather than slowing down operations, has actually speeded them.

(f) Starting furnace fires. From small unit heaters in the producing fields to marine and refinery boilers, serious explosions are still occurring because certain well-known fundamentals are not adhered to in the lighting of fires. Everyone knows what they are. It is merely a question of someone failing to do something which he knows perfectly well he should do.

Securing written approvals before action can take place is not positive proof that a misfortune will not occur; however, people will rarely give written approval unless they are positive that a given set of circumstances exists.

11. During the course of the design, selection, and placement of new equipment, is a formal safety study made to determine such matters as:

(a) Safe location in relation to other equipment. This applies to equipment already in place and in operation as well as to equipment being simultaneously erected. An engineering-design group may take every possible precaution and provide every reasonable device for injury and fire protection for a given unit, but what about the juxtaposition of the new unit in reference to other equipment already in place?

Potentially dangerous equipment sometimes is placed directly next to an area where there can be a ready source of fire or where there can be a heavy concentration of personnel.

(b) Safety guards for moving parts, stairways, runways, ladders, electrical equipment, hot lines, and so on. Various industry codes as well as state regulations now define basic required protection. Design engineers invariably follow such rules to the letter, but operating-unit designs and conditions change rapidly. Often design engineers have not had field-operating experience and are therefore not aware of operating hazards.

Consequently, a helpful step at the design stage is to have an operating man and a safety man check the design engineers at various stages to bring their attention to practical safety problems. To be most effective, these men should not be under the jurisdiction of the engineering department. It is not that the engineering people are not sympathetic to safety. I have always found them to be exteremely so. But bringing in operating and safety people, especially from the area where the equipment is to be used, lends an up-to-the-minute approach.

There will be differences of opinion from time to time, but that is good. Opinion is expressed that many safety changes can be made at the site at the time of erection, but, except for minor changes, it does not work out that way. Many of the safety aids are major items, such as location of motors, pumps, exchangers, or relief valves. Repair and maintenance men should be able to get them without standing on their heads.

(c) Fire protection. All that has been said concerning the value of considering the prevention of injuries at the design stage applies to fire protection. This matter is frequently left to consideration after the new equipment is in the process of being installed, but this is too late for some of the major changes which may be required for the best protection. A study and consultation at the design stage with the people who are going to have to fight any fires which may occur seems to make good sense.

12. Is there formal safety consideration when new products or processes are developed or when new materials are to be used, from the standpoint of possible hazards in their use?

How many times the use of new chemicals has caused toxicity problems! Such action would have been prevented had there been a formal safety check to study possible injury or fire hazards of all new chemicals prior to use. Double and triple checks of this can be made by requiring the purchasing departments to clear all chemical purchases with the safety department people, and then to have the storerooms check with the safety people when new chemicals are received.

Materials subject to spontaneous combustion or other special hazards in the event of exposure to fire have been used without proper knowledge. Formalities can be established to provide warning.

The same principles apply to the development of new processes. The research people will exercise their normal safety checks in the development of a process, but what is needed is to have a neutral group of operating and safety personnel examine the process to see where hazards can exist in its use. This would include the possible hazards during maintenance and repair as well as during regular operations.

As part and parcel of the advice to the field of adoption of new chemicals, materials, or processes, the research people would then include suggestions to the effect that they are or are not hazardous; if hazardous, the precautionary steps to be taken. Any notice to the field not having any safety suggestions would then be conspicuous, and questions could be raised. Similar warnings can thus be developed for customers who may use the new products or processes.

Disaster Control

There is great economic value in a formal disaster-control program. One calls for a great amount of planning. A comprehensive study of a plant, or any operation, by key personnel is needed to learn logical steps to follow. If something happens here or there, what should be done and who should do it? A plant's operations may not be too frequently reviewed in this light, so the economic benefit of such planning is that unsatisfactory conditions may be discovered which might not otherwise be noticed.

During the course of regular drills, "pretend" situations can be devised whereby men are asked what they would do in the event of certain emergencies. Automatic equipment is becoming so precise these days that it is a rarity to have to operate even vital controls by hand, and there could be considerable confusion in the event of an emergency. Men can be drilled and drilled in regular training programs, and that is just right, but disaster-

control drills put more spice into the activity.

Everyone from the manager to the office boy has a part in the proceedings. Time elements are noted, and it becomes a game to see how well a drill is carried out. It could be said that we do not need games to operate a company efficiently, but anyone who has participated in disaster drills knows that they help the morale of any group of men.

Unfortunately, many disaster control programs are allowed to go by default. Drills are postponed due to the press of other business, vacations, etc. New operating units are installed; old ones taken out; personnel enlarged, reduced or changed; and, scarcely before it is realized, the program is obsolete. This has a bad effect upon the personnel. They have usually been sold on the program from a personal-safety standpoint and as to the economic value to their company as well as to themselves because of job protection. It is always a pity to hear of such splendid programs being abandoned. They can pay high dividends.

Regular training. All supervisors and key personnel should receive regular training in proper methods of extinguishing the type of fires common to their operations. First-aid training is a natural part of such a program. It makes people more safety-minded because it teaches them the results of carelessness. The value of such training has been proven over and over again in benefits to fellow employes as well as to saving the lives of members of employes' families.

Mutual-aid plans among oil-company plants in an area are helpful. It is almost unbelievable to hear of plants wondering what they can do to help another plant in the area which is on fire, but it happens. Oil-company representatives in an area should get together regularly on a voluntary basis to determine what they can do to help one of their number who gets into trouble due to some type of disaster. The helpful steps which are agreed upon should be spelled out in writing, and test drills should be held regularly.

It is always helpful to have the local fire department serve as a regular member of the group. Fire chiefs are anxious to help. I believe the oil industry can greatly aid its own operations in this manner, help its public relations, and assist in preventing unnecessary restrictive regulations and ordinances. This especially applies to bulk plants and terminals. It doesn't make good sense for each bulk plant and terminal in a given area to purchase a minimum of fire protection when all of the companies in that area could work with the local fire department to help purchase maximum protection for the entire area with less payout for each company.

Mutual-aid programs can be most effective if voluntary joint safety inspections are made quarterly during which the group takes turns inspecting the properties involved for accident and fire hazards.

Next week:

SPECIAL REPORT ON

Natural Gas and Gas Pipelines

New methods used in the gigantic Canada-to-California pipeline, the status of the natural-gas market in California, and a rundown of the gas-reserve picture in Texas.

Nelson Construction Cost Indexes

Published in the first issue each month in the Technology-Operation Section.

Compiled by W. L. Nelson, Technical Editor and petroleum refinery consultant, Tulsa.

Charts of the indexes are published each year in a late January or early February issue.

Indexes of selected individual items of equipment and materials are also published on the Costimating page in the first issue of the months of January, April, July, and October.

Refinery Construction Cost Index (1946 Basis)

Explained on page 101 of the issue of August 5, 1957.

	1950	1954	1957	1958	1959	Oct. 1960
Pumps, compressors, etc.	138.2	166.5	206.7	214.7	226.5	228.8
Electrical machinery	134.9	160.0	188.9	192.7	195.8	193.8
Internal-combustion engines	126.0	150.5	173.9	178.3	178.5	179.5
Instruments	127.8	154.6	187.4	194.9	201.0	207.5
Heat exchangers	140.0	171.7	203.6	181.2	178.9	196.0
Miscellaneous equipment average	*126.2	160.7	192.1	192.4	196.1	201.1
Materials component	149.5	174.6	201.9	204.2	207.8	207.2
Labor component	144.0	183.3	208.6	220.4	231.6	245.1
Nelson construction index	146.2	179.8	205.9	213.9	222.1	229.9

*Used in computing the Nelson Index until April 1952.

Refinery Operating Cost Indexes (1956 Basis)

Explained on page 171 of the issue of June 1, 1959.

	1946	1952	1954	1958	1959	Sept. 1960
Fuel cost	49.6	81.0	86.5	102.1	103.5	113.8
Labor cost	73.1	88.7	90.9	105.0	102.3	101.0
Wages	52.4	81.5	88.7	105.4	111.5	115.2
Productivity	68.3	90.2	97.1	100.3	109.0	114.0
Investment, maintenance, etc.	51.2	83.6	92.0	109.5	113.7	117.9
Chemicals cost	37.0	72.1	85.7	104.4	107.8	114.3
Operating cost indexes:						
Refinery	58.5	80.5	88.7	105.8	106.8	110.0
Process units‡	62.9	82.2	88.4	105.8	106.0	109.6

‡Add separate index for chemicals, if any are used.

Formjel gives a penetration block ...not just a well bore coating!

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Formjel gets results where other methods fail because it penetrates and blocks *within the formation* rather than at the well bore alone. Another exclusive BJ Service development, this tough blocking agent has a variety of applications in acidizing and fracturing. It can be spotted to block one zone while another zone is treated... to stop channeling behind casing set through pay zones... to seal leaking packers... to block formations above or below a packer against vertical communication ... and to help achieve multiple fractures. Formjel has exceptional viscosity, zero API fluid loss and can carry solid blocking materials. Available in Regular Formjel which breaks completely in 5 to 24 hours, or in Long-Lasting Formjel which provides positive blocking action for up to 16 days.

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Results talk!

Formjel Stops Mud Loss Into Production Zone Where Oyster Shells Failed in Carter County, Okla.

PROBLEM: To stop mud loss into Flat Top Formation during cleaning out and milling operation. 1,600 lbs. of oyster shells—a solid blocking agent that is usually effective—failed to stop lost circulation, which reached 50 bbls./hr.

SOLUTION: Formjel was applied through the drill pipe in two 1,000-gallon stages. It effected a reduction in mud loss to less than 1 bbl. per hour for the remainder of the cleaning-out period—one week.

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New method leads to

Quick identification of formation brines

• Locating the source of produced salt water can now be done quickly and easily with a new method using flame spectrophotometry. Minimum amount of sample is needed, and method is free from analysis and calculation errors.

BY R. GEORGE MIHRAM
AND K. A. CATTO, JR.
Halliburton Co., Duncan, Okla.

A 30-ML. SAMPLE of brine, and less than an hour's time will give you positive identification of the source of water production in your well.

These results are possible now, using a new method of analysis involving a flame spectrophotometer.

And the test will detect a mixture of brines, or a brine diluted by fresh water—with reproducible results.

Why needed. Identification of the formation from which water is produced is needed to (1) control or eliminate the produced water, (2) identify the source of the water, (3) know whether one brine or several brines are being produced, (4) expand our geologic knowledge of subsurface formations, and (5) expand our knowledge of fluid flow in underground formations.

Previous attempts to correlate oil-field waters with geological formations have been complicated by two factors: (1) The actual source of the waters is completely inaccessible so that we can't be sure that a sample is from one and only one formation; (2) brines are fairly concentrated—15 to 30% solids—and usually are similar in chemical composition.

Up to now, brine identification has depended on chemical analysis to get the concentrations of calcium, magnesium, chloride, sulfate, etc. Direct examination of these analyses has been helpful in some cases.

As an aid to persons with limited chemical training, various graphic methods have been proposed.[1,2,3] These patterns again have been useful but many times they become worthless or even misleading.

Because of these difficulties, we have investigated a new concept for brine identification—the use of a spectral chart produced when a water is aspirated into a flamephotometer. The range covers 325 to 900 mμ (millimicrons). These charts are compared to standards for identification work. No references to this procedure have been found in the literature.

How it works. A water sample is introduced into a flame spectrophotometer and the entire spectral range is recorded. Comparison of these charts with charts from "standard formation waters," enables us to determine the source of a brine water.

While the method has been proven only for brine waters, there is no reason to believe that the same procedures might not be applied to fresh water.

The flame spectrophotometer is capable of detecting approximately 25 elements. However, under any given set of conditions, it is possible to detect a part of the elements. But, each element may have some effect on the peaks produced by other elements. So, when comparing charts, we find a great number of points for comparison as opposed to a small number from a chemical analysis.

Unlike a chemical analysis, it is not necessary to know anything about the elements present in the sample. We are interested primarily in the presence or absence of peaks, their shape, and in some instances, in their height. The latter is especially true when comparative samples are presented together.

Equipment used in our investigation consisted of a Beckman DU spectrophotometer, with flame attachment, photomultiplier, spectral adapter, and a Brown recorder. A wave-length marker consisting of a battery, condenser, and microswitches, was added to the recorder to manually mark wave lengths on the chart. Fifty-milliliter pyrex beakers, cut down to 2cm. height, are used as sample containers.

During the investigation, certain operating procedures have been developed which facilitate the analysis.

1. All brine samples must be diluted so that most of the peaks will remain on the chart with a minimum of background. The 500-mμ peak should be at least 15 chart units in height, yet remain on the chart. Based on the spectral charts, which we have made, the dilutions in Table 1 have been found to give very good results.

2. Brines which have an HCO_3^- content of 30 mg. per l. or more,

TABLE 1—DILUTION TABLE

Sp. gr.	Dilution
1.00	No dilution
1.05	1 part sample + 24 parts distilled water
1.10	1 part sample + 49 parts distilled water
1.15	1 part sample + 199 parts distilled water

"... addition of organic solvents such as acetone or alcohols to the diluted sample may make it possible to demonstrate the presence or absence of elements that are poor emitters."

TABLE 4—OPERATOR'S INTERPRETATION OF SPECTRAL CHARTS

Water sample—	A	B	No. 2
Peak at 625 and 650 mμ (1)	Identical to 1 and 3	Identical to 4	Between A and B
675 mμ (2)	Identical to 3	Identical to 4	Identical to 1 Similar to B and 4
825 mμ (4)	Identical to 3	Identical to 4	Similar to B and 4
360-365 mμ (8)	Identical to 3	Similar to 4	Between B and A
371 mμ and 381-385 mμ (9)	Identical to 3—unusually large	Similar to 4 and 2	Between B and A, larger than B
390 mμ (10)	Identical to 3—part of band	Similar to 4 peak	Similar to A and 3—band
395 mμ and 398 mμ (11)	Identical to 3—part of band	Identical to 4—distinct peaks—note left base 395-mμ peak	Similar to B and 4—peaks—note left base 395-mμ peak
405 mμ (12)	Identical to 3	Identical to 4	Larger than A, 3, and 1—not as large as B and 4
408 mμ (13)	Identical to 3—no peak	Identical to 4—peak	Similar to 4 and B—peak
500 mμ (20)	Identical to 3	Identical to 4	Between A and B
518 mμ (21)	Similar to 3—not clear—double peak	Identical to 4	Between A and B
556 mμ (22)	Similar to 3 in width	Similar to 4 in width	Between A and B in width

Peaks in Fig. 1 labeled 3, 5, 6, 7, 14, 15, 16, 17, 18, 19, 23, and 24 contribute no information on these samples. May be useful in other cases.

after dilution, should be boiled with a few drops of HCl before the dilution is made.

3. Batteries in the instruments must be kept in first-class condition.

4. Tank pressures should be maintained at 16 psi. for H_2 and 40 psi. for O_2. Burner pressure is dependent upon the individual burners and is adjusted to give maximum emission for calcium and magnesium lines at 556 and 371 mμ.

TABLE 2

Wavelength mμ	Element
825	Na
775	K
670	Li
625	Ca
589	Na
556	Ca
500	Na and Mg.
461	Sr
423	Ca
406	K
397	Background + Ca
395	Background + Ca
381 to 385	Mg band
386 to 373	Fe lines
371	Mg band
331	Na

Operating Procedure

After the sample is properly diluted it is necessary to make three sets of instrument settings and to record a spectrum in three steps.

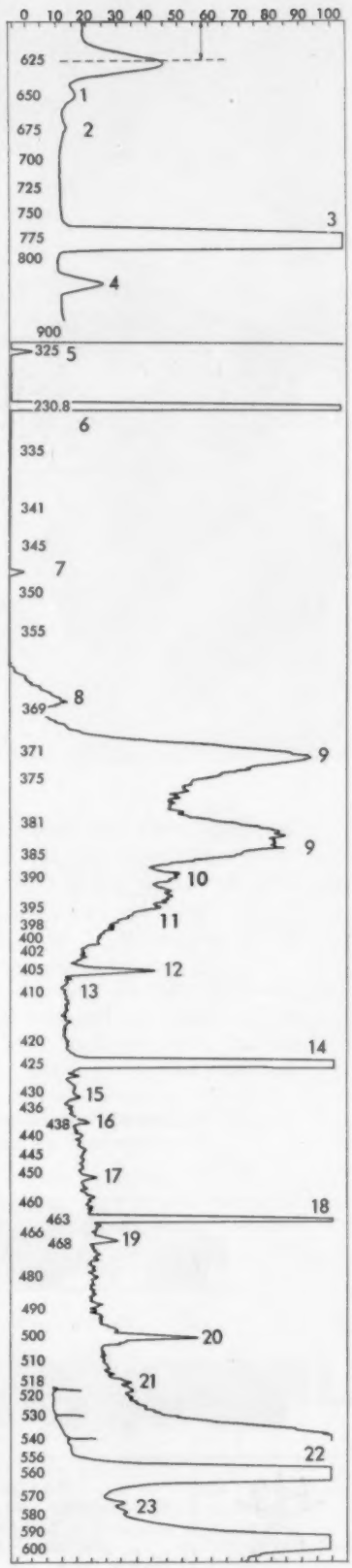
1. Instrument settings for recording the 600 to 520-mμ range:

Blue sensitive photomultiplier tube.

TABLE 3—CHEMICAL ANALYSIS

Sample	A Mg./l.	B Mg./l.	No. 2 Mg./l.
Sp. gr.	1.04	1.05	1.04
pH	7.1	6.5	6.7
TDS*	61,700	79,600	72,700
Ca	3,040	5,580	4,510
Mg	2,440	970	1,600
Cl	36,600	43,400	41,000
SO_4	2,250	140	990
HCO_3	461	280	380
Na	16,860	20,056	19,021

*Total dissolved solids.



SPECTRAL CHART for sample A is typical of those run on other samples described in this article. Wave length (scale on the left) and peak shape are usually more important in interpretation than is peak height.

Congrats and $25 for this quip to DEAN H. CROWELL, 5919 Vickery Boulevard, Dallas, Texas

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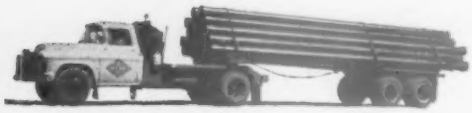
Neighbor, wherever you are, specify Lone Star and we both get a good deal.



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100% adjust knob—minimum.

Dark current adjustment—adjust pen to the 10 chart line as sample is aspirated into flame at 365 mμ.

Slit width 0.06 mm.

2. Instrument setting for recording the 520 to 325-mμ range:

Blue sensitive photomultiplier tube.

100% adjust knob—maximum.

Dark current adjustment—adjust pen to the 10 chart line as sample is aspirated into flame at 365 mμ.

Slit width 0.06 mm.

3. Instrument settings for recording the 900 to 600-mμ range:

Red sensitive tube.

100% adjust knob—maximum.

Dark current adjustment—adjust pen to the 10 chart line as sample is aspirated into flame at 715 mμ.

Slit width 0.2 mm.

After a setting adjustment is made, the wave-length selector is returned to the beginning of the range and the recorder started to chart the required range. These charts are then compared with those of known formation waters, or, against charts made from samples submitted for comparison.

In general, the peaks found on the chart can be related to the elements causing the peaks. In a few instances, we find peaks which we have not correlated with elements. Some peaks generally found to be useful and the elements related to them are listed in Table 2.

Interpretation. Even though most samples contain essentially the same elements, they usually are present in different quantities, which affects the peak height and shape. Different combinations and quantities often present a difficult problem in regular flame photometry due to mutual interference, but with this method such interferences may be a great help. Mixtures of brines with fresh waters are easily identified.

While peak height measurement can be useful, generally the location of the peak and its general shape is more significant. It is necessary to have a library of formation - water charts, or samples, for comparison.

In our laboratory we have received monthly samples from certain wells for over a year. The charts of these waters have remained constant and uniform over

this period of time, although maintenance required changing batteries three times, and using two different burners.

The charts, as produced, are 30.5 cm. long and 133 cm. wide. For storage purposes they are photographed on 5.5 by 24-cm. film, large enough for comparison work. Usually the charts are compared side by side. Sometimes it is helpful to superimpose the charts over a light box.

Recording two spectra on the same chart is inadvisable since the resulting chart may become very confusing.

Test Results

Two formation-water samples were selected at random and called A and B. From these two samples, four unknown mixtures were prepared. All six samples were given to an operator for identification.

Sample No. 1 was prepared with 15 cc. of B and 10 cc. tap water. Sample No. 2 contained 15 cc. of B and 10 cc. of A. Sample 3 was identical to A and sample 4 was identical to B.

The chemical analyses, Table 3, the specimen spectral charts for sample A, Fig. 1, and the operator's comments, Table 4, are given to show the positiveness and ease with which identification can be made. Data shown include only those for the control Samples A and B and one unknown, No. 2.

This method of formation-water comparison is new, and further work remains to be done. It will become more useful as the collection of reference charts grows larger. It is hoped that investigation of synthetic waters will reveal the cause of the unidentified peaks.

Preliminary investigation shows that the addition of organic solvents such as acetone or alcohols to the diluted sample may make it possible to demonstrate the presence or absence of elements that are poor emitters. Several new fuels are being proposed for flame photometry that might improve these spectras.

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Smog control decrees less olefins in

Here's a look at the processes you may expect, and

• As the pressure for smog control grows, refiners may well be forced to limit the amount of olefins in gasoline. Los Angeles refiners are currently faced with such a regulation. It may spread. Faced with this prospect, Atlantic studied the effects such a move would have on processing and its cost.

BY MERRILL J. FOWLE, JOHN A. NEVISON, C. DAVIS WRIGLEY, AND MARTIN BRILL
Research & Development Department, Atlantic Refining Co., Philadelphia

SEVERAL TYPES of processing were studied to evaluate the effect of each of these methods on profit. A 50,000-bbl. Gulf Coast refinery was assumed which produces gasoline and No. 2 heating oil in the ratio of about 2 to 1.

Results of this study showed:

- The major contributor to gasoline-pool bromine number is catalytic naphtha. Olefins from this source can be minimized by using a silica-alumina rather than a silica-magnesia cracking catalyst.
- Either hydrogen or alkylation of catalytic amylenes and hexenes will cut gasoline-pool olefins by 8 to 10 bromine numbers.
- Alkylating propylene will cut another three to four bromine numbers, if this material has been finding its way into the gasoline pool by polymerization.
- Choosing a platinum reforming catalyst with silica-alumina in its base can provide maximum isobutane for additional alkylation.
- Cost of removing catalytic amylene and hexene by hydrogenation amounts to about 4 cents per barrel of gasoline. It costs 16-18 cents per barrel by alkylation under the conditions assumed in this study. To these costs must be added a capital requirement of about $50 or $100 per daily barrel of crude capacity.
- Cost of cutting olefins 13 bromine numbers is 9-12 cents per barrel of gasoline, plus about $150 capital per daily barrel of crude refined.

Adapted from a paper presented to the forty-fourth national AIChE meeting, New Orleans, February 26, 1961.

Source of olefins. Propylene polymer is the highest-olefin-content material in the gasoline pool. However, polymer is usually present in relatively low concentrations, so its contribution to the bromine number of the total gasoline pool is relatively modest. Naphtha from catalytic cracking, on the other hand, is present in rather high concentration, thus making its 35-40% olefinic content the most important contributor to the bromine number of the total pool. Blending of premium and regular grades changes the olefinic effectiveness of each of the components relative to that shown. However, for purposes of simplification, gasoline-quality changes were studied on a total pool basis.

Processing to Reduce Olefins

Since catalytic naphtha is the major source of olefins, it is logical that any program for olefin reduction be directed initially at this material.

Table 1—Estimate of 1966 Octane Requirements Two-Grade Marketing System

	Research	Motor	Road
Premium	102	94	101.4
Regular	97	86	95.8
Pool—30/70 premium/regular	98.4	88.4	97.5
Pool—50/50-premium-regular	99.3	90.0	98.6

Table 2—Analysis of Typical Debutanized Catalytic Naphtha SiA1 Cracking Catalyst

Mol. Wt.	Approx. Vol. %	Approx. Vol. % Olefins	Approx. Bromine No.
C_5	20	54	124
C_6	17	54	103
C_7	15	48	79
C_8	13	24	34
C_9 and heavier	35	16	18
Total	100	36	65

Table 2 summarizes the olefins in a debutanized catalytic naphtha produced over synthetic silica-alumina cracking catalyst at 900° F. This information on olefin content was obtained by mass-spectrometer analyses and the approximate bromine numbers were estimated from correlations. The data show that the highest olefinic content of debutanized catalytic naphtha is in the C_5 and C_6 carbon number range.

Commercial processes which might be used to eliminate catalytic amylenes and hexenes are: (1) hydrogenation; (2) alkylation; or (3) hydrocracking.

Hydrocracking. This process would probably be most advantageous when used as an alternate to catalytic cracking in a new refinery. This would be true especially if a higher gasoline-to-furnace oil ratio were desired. Since this is not the situation here, this possibility has not been included.

Hydrogenation. In general, hydrogenation of olefins is characterized by a decrease in research octane number and an increase in leaded motor octane number. Road octane number can increase or decrease depending on the olefin hydrogenated. In the case of catalytic amylenes and hexenes, little effect on road octane will be evident.

Alkylation. Reducing olefin content by alkylating amylenes and hexenes as well as butylenes, introduces a demand for isobutane which is greater than can normally be supplied by catalytic cracking and reforming. Additional isobutane can, of course, be supplied by the purchase of normal butane and the subsequent isomerization of n-butane to isobutane.

Reforming catalyst can, to some extent, affect isobutane balance.

gasoline

a cost comparison

There are two general types of catalyst available for use which have distinctive yield distributions. These are the platinum-alumina and the platinum - silica - alumina catalysts. In this study, RD-150 catalyst is considered representative of the platinum-alumina and Atlantic-16 is the platinum-silica-alumina type.

The reforming catalyst with silica-alumina as a base offers significantly higher normal and isobutane yields at the expense of lower gasoline yield. This higher-isobutane-yield characteristic can be most useful where there exists a high alkylation requirement, and especially where it forestalls the installation of isomerization processes. The alumina-based catalyst, at constant reformate octane, exhibits longer catalyst life.

Olefin-Removal Cost

Amylenes and hexenes. Gasoline-pool quality and refinery material balances resulting from hydrogenation or alkylation of cataltic amylenes and hexenes as described above, are compared with our base refinery position in Table 3.

For this comparison, it has been assumed that premium gasoline is 30% of total gasoline output.

Tetraethyl lead levels are those required to maintain the road octane requirement of 97.5 calculated for that gasoline distribution in Table 1. It is recognized that this assumption may not be consistent with current marketing procedures, but the authors feel that the road octane denominator best reflects gasoline quality.

Because of the volume increases in hydrogenation and alkylation, crude throughput was adjusted to maintain constant gasoline production. A lower reforming severity was shown as optimum in Case 2 (alkylation of amylenes and hexenes) when compared to Case 1 (base). Note that either Case 2 or Case 3 (hydrogenation) reduces bromine number about 10 units from the base level of 23.

These are the assumptions used in making this study

SINCE most moves to reduce gasoline olefin content would require considerable time, a projection of 5 years, or 1966, has been chosen for this study.

Gasoline octane requirements for that year have been predicted by projecting recent monthly average octanes for both premium and regular grades reported for the Philadelphia area by Ethyl Corp.

These forecasts (Table 1) are based on using the same gasoline processing techniques as today, with increased octane potential coming mainly from increased reforming severity.

Research octane forecasts for 1966 are 102 octane for premium gasoline and 97 octane for regular grade. Corresponding motor octanes are 94 and 86 respectively. These octane values are representative of gasoline quality marketed on the East Coast.

Examination of West Coast octane trends indicates that a slightly lower octane-level product has been marketed but recent octane increases have been narrowing the gap in octane quality between East and West Coast. Thus, the projection to 1966 of East Coast gasoline quality is believed to be applicable to the West Coast marketing area as well.

Estimated road octanes for the premium and regular grades are 101.4 and 95.8 respectively. These values are determined from existing relationships between gasoline research octane, sensitivity, and road octane.

Road testing of commercial 1959 premium fuels in high requirement cars provided data used in developing this correlation, which weighs research and motor octanes in a ratio of about two to one in determining road octanes. While a single relationship has been used in this study for simplification, it is recognized that this ratio varies with both fuel and car.

This relationship between octane qualities is quite significant—any change in gasoline composition which decreases its sensitivity also decreases the required research octane number to maintain constant road octane and in turn constant car satisfaction. Since reduction of olefin content will also reduce the sensitivity of gasoline, the cost of lowering gasoline olefin content could be reduced by recognizing and holding constant the road octane quality rather than the research octane which is the most prevalent current industry scale.

Processing. A typical refinery has been developed having a Gulf Coast location and processing nominally 50,000 bbl. per day of Mid-Continent crudes.

It is assumed that primary crude distillation cuts a light straightrun naphtha, a reformer stock from C_6's through 360° F., and a virgin furnace-oil stream boiling from 360° to 600° F.

It is further assumed that all material boiling from furnace oil end point to about 1,050° F., would be available for charge to catalytic cracking by atmospheric and vacuum distillation.

Material boiling heavier than 1,050° F. is charged to thermal visbreaking and vacuum flashing in order to recover additional material for catalytic cracking feed.

Catalytic reforming is at about optimum severity.

Catalytic cracking is performed at 900° F., recycling heavy cycle oil to extinction and taking all light cycle stock as furnace-oil product.

Catalytic propylene is recovered for polymerization to gasoline stock; propane is recovered for sale as liquefied petroleum gas; butylenes are alkylated; normal butane and any isobutane in excess of alkylation requirements are used for gasoline vapor-pressure blending.

Tetraethyl lead is used exclusively as an antiknock additive in octane blending. Normal butane is also assumed purchasable.

Operation of this refinery is directed toward production of gasoline and No. 2 heating oil in the approximate ratio of 2 to 1. As processing is changed from the base sequence to reduce gasoline olefin content, crude charge and other products were allowed to vary while maintaining constant gasoline production.

TABLE 3—PROCESSING FOR OLEFIN REDUCTION

(Premium-regular gasoline ratio—30/70, SiAl catalyst)

Case No. and description—	(1) Base Case (Butylene Alky.)		(2) Base Case Plus Alkylation of Cat. C_6= and C_6=		(3) Base Case Plus Hydrogenation of Cat. C_5= and C_6=		(4) Case 3 Plus Propylene Alkylation	
Reforming catalyst	A-16	RD-150	A-16	RD-150	A-16	RD-150	A-16	RD-150
Reforming severity, vol. % C_5 + yield	81	83	83	85	81	83	82	83
Refinery input, bbl. per day:								
Crude	50,000	49,000	46,700	45,800	49,900	48,900	47,400	46,400
n-Butane	.....	400	1,500	2,500	.....	400	1,100	2,000
Refinery products:								
11-lb. R.v.p. gasoline, B/D	27,800	27,800	27,800	27,800	27,800	27,800	27,800	27,800
Pool TEL, ml./gal.	2.1	2.0	2.2	2.1	2.2	2.1	2.1	1.9
Pool RON	98.1	98.1	97.7	97.8	97.8	97.8	97.5	97.6
Pool MON	89.3	89.3	90.1	90.0	90.0	89.9	90.3	90.1
Pool road octane number	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5
Pool bromine number	23	23	13	13	14	14	10	10
No. 2 heating oil, B/D	14,700	14,500	13,800	13,500	14,700	14,400	14,000	13,700
No. 6 fuel oil, B/D	3,300	3,300	3,100	3,100	3,300	3,300	3,200	3,100
Commercial propane, B/D	2,100	1,900	1,800	1,700	2,100	1,900	1,900	1,800
Gas, M.M.c.f.d.	128	148	113	131	123	143	116	136
Excess butanes, B/D	500	.....	.....	.....	500	.....	.....	.....
i-Butane production via n-butane isomerization, B/D	.....	.....	200	600	.....	.....	200	700

Prices used in evaluating these alternatives are summarized in Table 4. The composite crude price represents posted prices plus transportation to the refinery. Normal butane is assumed to be purchasable or salable at 9 cents per gallon. Bulk product prices are forecasted 1966 lows of Gulf Coast cargo postings. Refinery gas is valued at natural gas equivalent.

Results of the economic evaluation are summarized in Table 5.

The indicated refinery profit of 23 cents per barrel of crude for the base case decreases to about 15 cents per barrel in Case 2 and to about 20 cents per barrel in Case 3.

These decreases are mainly the result of the additional processing required for olefin removal. These figures, expressed in dollars per day, indicate a loss over the base case of $4,500-$5,100 for Case 2, and $1,200 for Case 3.

Relating these losses to gasoline production results in a cost of 16 to 18 cents per barrel of gasoline for olefin reduction by alkylation, and about 4 cents per barrel by hydrogenation.

Operating costs used in the economic evaluation are total manufacturing costs including normal depreciation on all invested capital. It is evident that, if a refiner is operating under Case 1, more capital investment would be required to get to cases 2 or 3

For the refinery assumed in these calculations, estimates show that about $5,000,000 capital investment would be required for the additional alkylation and isomerization facilites of Case 2, and about $2,500,000 for the increased facilities required in Case 3. The effect of including a return on this capital should not be ignored. If an investors' method return of 10% after taxes is desired, an additional $1,800 per day or 10 cents per barrel of gasoline for case 2 and $1,400 per day or 5 cents per barrel for case 3 should be added to the costs in Table 5.

TABLE 4—PRICES USED IN ECONOMIC EVALUATION

Refinery feed:	
Crude, per bbl	$3.10
n-Butane, cents/gal.	9.0
Refinery products:	
Premium gasoline, cents/gal.	15.0
Regular gasoline, cents/gal.	11.0
No. 2 heating oil, cents/gal.	8.5
No. 6 fuel oil, cents/gal.	5.1
Commercial propane, cents/gal.	5.8
n-Butane, cents/gal.	9.0
Refinery gas, cents/therm	2.0

From this analysis, hydrogenation of catalytic amylenes and hexenes appears less costly than alkylation. However, other situations may alter this conclusion for some refiners. For example, C_4's may be available at a lower cost. Available incremental alkylation plant capacity would also tend to decrease alkylation costs. Too, the hydrogen required for hydrogenation, included here at fuel value, might have to be generated in new equipment at a much higher cost. Alkylation also affords a higher total-gasoline-pool octane potential than does hydrogenation, and might well permit more economical blending of specific gasoline grades.

Propylene polymer. If further reduction in gasoline bromine number is required, removal of olefins contributed by propylene polymer will decrease bromine number to about 10. Again, the alternatives of direct

TABLE 5—COST OF OLEFIN REDUCTION

(Premium/regular gasoline ratio—30/70. SiAl catalyst)

Case—	(1)		(2)		(3)		(4)	
Reforming catalyst	A-16	RD-150	A-16	RD-150	A-16	RD-150	A-16	RD-150
Net value of products, $ per bbl. of crude	4.24	4.22	4.27	4.25	4.24	4.23	4.26	4.25
Crude cost, $ per bbl.	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10
Manufacturing cost, $ per bbl.	0.91	0.89	1.02	1.01	0.94	0.92	0.98	0.97
Refinery profit, $ per bbl. of crude	0.23	0.23	0.15	0.14	0.20	0.21	0.18	0.18
Thousands of dollars per day	11.3	11.5	6.8	6.4	10.1	10.4	8.7	8.3
Gasoline-pool bromine number	23	23	13	13	14	14	10	10
Cost of olefin reduction compared to Case 1:								
$M/D	...	...	4.5	5.1	1.2	1.1	2.6	3.2
Cents/bbl. gasoline	...	...	16.2	18.3	4.3	4.0	9.4	11.6
Cents/bbl. bromine number	...	...	1.8	2.0	0.5	0.4	0.7	0.9

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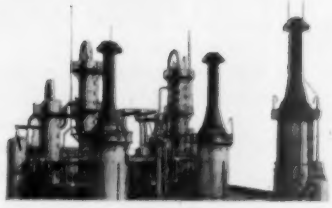

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hydrogenation of propylene polymer or alkylation of propylene are possibilities. Because hydrogenating of propylene polymer decreases road octane, only alkylation was considered. In addition, propylene rather than polymer would be alkylated, thus permitting shutdown of polymerization facilities with attendant cost savings.

Effect of adding propylene alkylation to Case 3 has also been shown in Tables 3 and 5. Of particular interest, in Table 3, is the considerably smaller isomerization unit required when using platinum-silica - alumina reforming catalyst. This is, of course, a result of the greater isobutane producing characteristic of this catalyst.

Over-all, the costs for reducing to the Case 4 gasoline-pool bromine number level of 10 from the base level of 23 are estimated to be $2,600-$3.200 per day, depending on the reforming catalyst. This increases normal gasoline production costs by 9-12 cents per barrel. To realize a 10% return on invested capital (estimated to be $7,500,000 for Case 4 over Case 1) an additional cost of 15 cents per barrel of gasoline results.

Effect of Premium Sales

The effects of increasing premium-grade sales from 30% up to 50% of the total gasoline pool are summarized in Table 6. Higher reforming severity is generally required to reach the higher gasoline-pool octane requirement. Although profit margins are considerably greater than those calculated for Cases 1 through 4 because of the larger percentage of premium sales, olefin-reduction costs are estimated to be comparable.

Octane Number

In the cases described thus far, octane calculations have been made on a constant road basis. As gasoline-pool motor octane potential increased by hydrogenating and alkylating olefins, the pool research octane sendout was adjusted to compensate.

If it were necessary to maintain constant research octane, somewhat higher tetraethyl lead costs would have resulted. This is shown by the summary in Table 7 which compares cost of olefin removal on the two octane bases. Since any cost differences are more evident at higher lead levels, the cases assuming a 50-50 premium - to - regular grade gasoline distribution were used.

In Case 5, which produces a gasoline pool of typical sensitivity, little change in economics is noted upon converting from a road to a research octane basis. In Case 7, however, in which the research and motor octane relationship has been appreciably changed (7.5 sensitivity) a 25% increase in TEL is required in converting to a constant Research octane basis.

Thus, an advantage of about $1,300 per day is indicated for the

TABLE 6 — EFFECT OF HIGHER PREMIUM/REGULAR GASOLINE RATIO ON OLEFIN REDUCTION ECONOMICS

(Premium/regular gasoline ratio—50/50. SiAl catalyst)

Case No.—	(5)		(6)		(7)	
Description—	Base case (butylene alkylation)		Base case plus hydrogenation of Cat $C_5=$ and $C_6=$		Case 6 plus propylene alkylation	
Reforming catalyst	A-16	RD-150	A-16	RD-150	A-16	RD-150
Reforming severity, vol. % C_5+ yield	79	81	79	81	79	81
Total gasoline pool:						
Bromine number	23	23	14	14	10	10
TEL, ml./gal.	2.8	2.6	2.9	2.7	2.7	2.5
RON	99.1	99.2	98.8	98.9	98.7	98.8
Motor octane number	90.3	90.3	91.1	91.0	91.3	91.3
Road octane number	98.6	98.6	98.6	98.6	98.6	98.6
Refinery profit:						
$/bbl. crude	0.36	0.37	0.33	0.35	0.32	0.32
$M/day	17.9	18.2	16.6	16.9	15.3	15.0
Cost of olefin production compared to Case 5:						
$M/D	....	....	1.3	1.3	2.6	3.2
Cents/bbl. gasoline	....	....	4.7	4.7	9.4	11.6
Cents/bbl., bromine number	....	....	0.5	0.5	0.7	0.9

TABLE 7—COST OF OLEFIN REDUCTION

(Premium/regular gasoline ratio—50/50. RD-150 reforming catalyst, SiAl cracking catalyst)

	Constant road octane		Constant research octane	
Case No.	5	7	5	7
Reformer severity, vol. % C_5+ yield	81	81	81	81
Total gasoline pool:				
Bromine number	23	10	23	10
TEL, ml. per gal.	2.6	2.5	2.7	3.1
RON	99.2	98.8	99.3	99.3
Motor octane number	90.3	91.3	90.5	92.0
Road octane number	98.6	98.6	98.7	99.3
Refinery profit, $M/day	18.2	15.0	18.0	13.5
Additional cost for maintaining RON, $M/D	....	....	....	1.3

TABLE 8—EFFECT OF USING SiMg CRACKING CATALYST ON COST OF OLEFIN REDUCTION

(Premium/regular gasoline ratio—30/70. RD-150 reforming catalyst)

Case description—	Base case (butylene alkylation)		Base case plus hydrogenation of cat $C_5=$ and $C_6=$	Base case plus hydrogenation of cat C_5's and C_6's plus propylene alkylation
Cracking catalyst	SiAl	SiMg	SiMg	SiMg
Reforming severity, vol. % C_5+ yield	83	81	81	81
Total gasoline pool:				
Bromine number	23	25	17	14
TEL, ml./gal.	2.0	2.7	2.8	2.6
RON	98.1	97.9	97.6	97.5
Motor octane number	89.1	89.5	90.2	90.3
Road octane number	97.5	97.5	97.5	97.5
Refinery profit:				
$/bbl. crude	0.23	0.20	0.17	0.16
$M/day	11.5	9.9	8.6	7.5
Cost of olefin reduction compared to base case:				
$M/D	....	1.6	2.9	4.0
Cents/bbl. gasoline	....	5.8	10.4	14.4

constant road calculation. This is a substantial driving force to take advantage of the inherent improved octane quality of gasoline and lower sensitivity. Alternately, this can be regarded as an additional cost of olefin removal, if it is not possible to take advantage of the improved sensitivity.

Effect of Cracking Catalyst

Thus far, we have dealt with catalytic cracking operations carried out over a silica-alumina cracking catalyst. Another synthetic cracking catalyst receiving attention recently is silica-magnesia.

Yield distributions over these catalysts are quite different. Silica-magnesia catalyst is characterized by a higher naphtha yield which comes at the expense of lighter products. The naphtha, however, is more olefinic (especially the heavier fraction) and is lower octane. And over all gasoline bromine number is about two units higher than with the silica-alumina catalyst.

Therefore, a refiner using silica-magnesia catalyst can reduce olefins moderately by converting to a silica-alumina catalyst. Under the economic conditions of this study, such a move is indicated to increase refinery profit by about $1,600 per day. In subsequent moves to decrease olefins, the use of the silica-alumina catalyst would probably be continued with the costs previously discussed.

Assuming, however, a choice is made to continue using silica-magnesia cracking catalyst, the costs for reducing bromine number via the routes selected for the silica-alumina-catalyst cases have been estimated and are summarized in Table 8. When compared to a base using silica-alumina catalyst, amylene and hexene hydrogenation and propylene alkylation are more costly. However, relative to a base using silica-magnesium catalyst, the incremental costs associated with these processing steps are roughly the same as when using silica-alumina catalyst.

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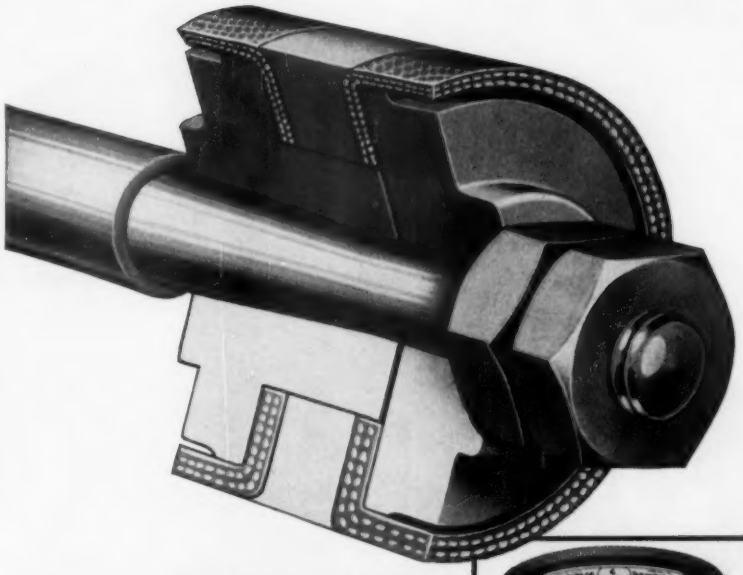

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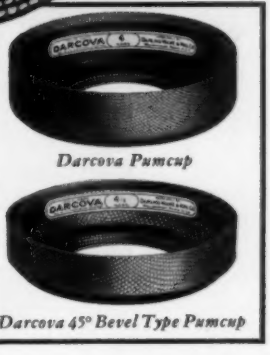

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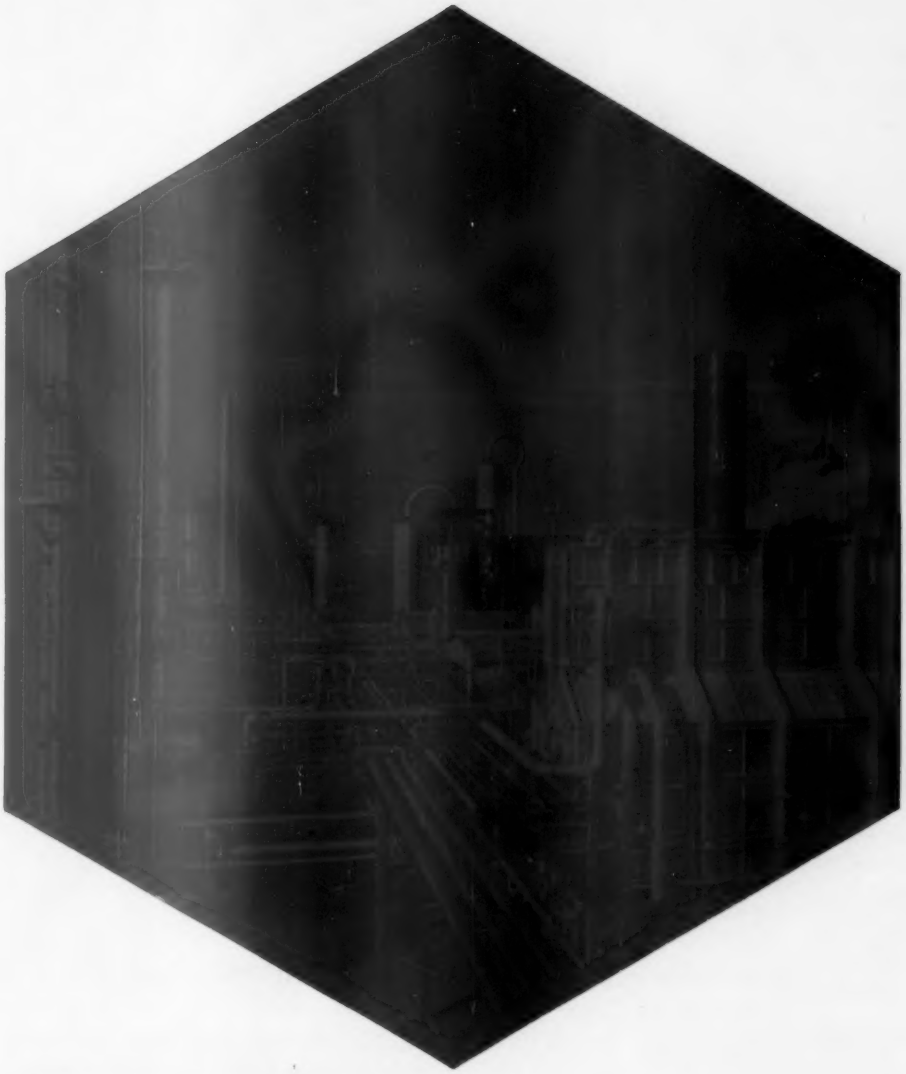

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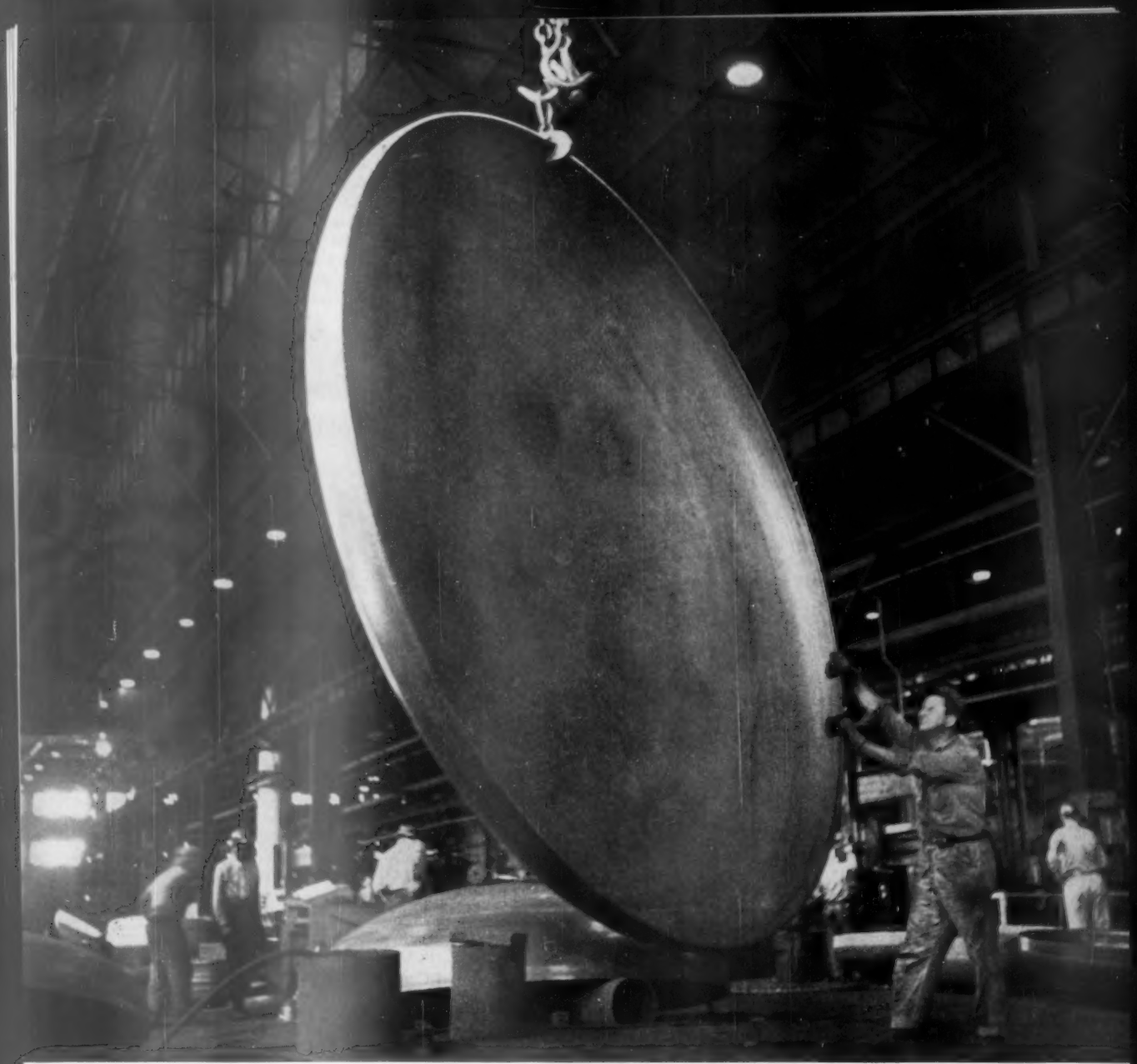

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Bethlehem makes flanged-and-dished heads to meet virtually every requirement: ASME Code, elliptical and standard flanged-and-dished. Also flanged-only, dished-only, shallow-dished, double-dished, and heads for special requirements.

Bethlehem heads are available in diameters up to 165-in.—and in thicknesses from 14 gage to 3-in. We also produce standard manhole and hand-hole saddles, covers and fittings, as well as heads with flued openings. A number of sizes of ASME Code flanged-and-dished heads are stocked for prompt delivery.

HOW TO REDUCE COSTS BEFORE YOU ORDER

A number of suggestions that may help you to reduce costs are contained in our folder "Pertinent Facts on Purchasing Flanged and Dished Heads." Factors that govern the price of heads are described, and a list of the required data for orders and inquiries is included. Ordering from our stock sizes at Sparrows Point, Md., may save you time and money; a full list is contained in the folder. A copy is yours for the asking at any Bethlehem sales office, or write to us direct at Bethlehem, Pa.

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PART 1—HEAT TRANSFER

ABC's of heat-transfer principles

HEAT is a form of energy and energy cannot be created or destroyed. The movement of heat is called heat transfer.

Heat always tends to pass from warmer objects to cooler ones. A simple example is the heating of a pan of water on a stove. Heat from the burning gas is transmitted through the metal of the pan to the water.

In a refinery, transfer of heat is very important. The successful operation of most processes is dependent on correct application of the principles of heat transfer. Where we are handling a hot material we may insulate the system to hold the heat in; where the material is cold we may insulate to keep the heat out. Efficient equipment, designed to take full advantage of processing heat, is in use in all refining operations.

Methods of Heat Transfer

There are three methods of heat transfer called conduction, convection, and radiation.

Conduction is the transfer of heat from one part of a body to another part of the same body, or from one body to another body in physical contact with it, without movement or mixing of particles.

If a silver spoon is placed in a cup of hot coffee, the handle of the spoon will get hot. Similarly, when one end of an iron poker is placed in a fire, the other will get too hot to touch. If, however, one end of a wooden rod is placed in a fire the other end will be warmed hardly at all.

We can conclude from this that metal is a good conductor of heat and that wood is a poor conductor of heat. Fig. 1 demonstrates how heat can be conducted through a metal rod. Fig. 2 shows that different metals conduct heat at different rates.

Convection is the transfer of heat from one place to another within a liquid or gas by mixing one portion of liquid or gas with the other. The transfer of heat by convection is used both in heating and in cooling our homes.

A steam radiator is a good example of heating by convection. Air in contact with the radiator warms and rises. It is replaced by cooler air which rises as it is warmed. Warm air rises because, as it is warmed, it (like any gas) expands. The expanded hot air is less dense than cooler air and therefore "floats" or rises. This movement of air provides a good means of heating our homes. A simple example of how convection currents work is shown in Fig. 3.

Radiation is the transmission of heat from a heated body to a cooler body by heat waves.

The heat we get from the sun is an example of radiation. The sun rises in the morning and the earth is warmed almost instantly. When it goes out of sight in the evening, the earth cools as quickly as it was warmed.

Another example is warming one's self by an open fire. The side next to the fire gets warm while the opposite side remains cool. Turn around and the cool side warms up and the warm side cools off. Since you are not actually touching the fire, this warming cannot be by conduction. Likewise it cannot be heat transmission by convection for only the side next to the fire is warmed. If it had been heat by convection then both sides would have been warmed alike. Thus it can be said that it was heat by radiation.

Heat rays (or radiated heat) are very similar to light rays because they move in straight lines as light does and at the same speed. To receive heat by radiation you must be able to "see" the hot object which is radiating heat.

Furnace operation is a good example of the use of all three methods for transmitting heat. The furnace is equipped with alloy or steel tubes through which oil is flowing.

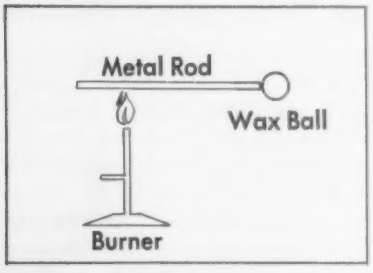
Fired burners radiate heat to the metal tubes. Those tubes which can "see" the flame and therefore receive radiant heat are called radiant tubes and that part of the furnace is called the radiant section.

Heat is conducted through the walls of the tube into the oil. This is heat transfer by conduction.

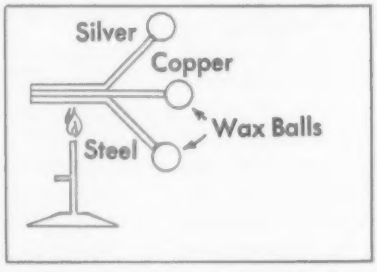
The velocity through the tubes is high enough to cause turbulent flow. This mixing of the warmed oil flowing next to the wall of the tube with cooler oil in the middle of the tube is an example of heating by convection.

Heating of some furnace tubes is also accomplished by contact with flue gases. Heated gases from combustion of the fuel rise and pass through the furnace stack. A bank of tubes placed so that they come in contact with hot flue gases can pick up considerable heat from the gases. Such a bank of tubes is known as the preheater or convection section of the furnace. Heat is transferred to the oil in this section by both convection and conduction.

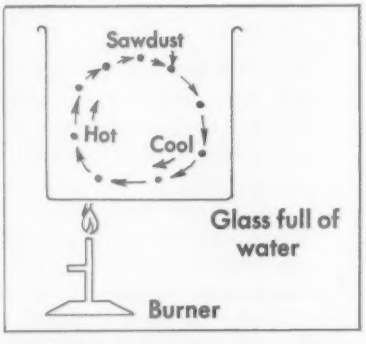
This material taken from process-training-program manual, Bayway, N. J., refinery of Humble Oil & Refining Co.



PLACE A WAX BALL on the end of a metal rod and place the other end of the rod over a flame. As the rod heats up the wax ball will start to melt and will soon fall off the end of the rod. Fig. 1.



JOIN silver, copper, and steel rod together at one end over a flame. Wax placed on top of silver rod melts first, then that on the copper rod, and last the one on the steel rod, showing conductivity. Fig. 2.



FILL A GLASS BEAKER with water, and add a little sawdust. Heat the beaker. The water and sawdust movement shows that water is set in motion by heat. Circulation will continue until water heats to boiling point. Fig. 3.

look at another dimension -to find oil or gas

When two porosity devices disagree on the apparent value of porosity, *the difference is significant.*

Each log responds to a characteristic that is related to porosity; each log also may be affected by other characteristics in a particular manner.

For example, gas affects the Sonic and Neutron Logs in an opposite manner—the difference readily indicates the presence of gas.

The appropriate choice of porosity logs will depend upon formation and hole conditions. The following porosity tools are available from Schlumberger:

Sonic Log Microlaterolog Proximity Log
Neutron Log Gamma-Gamma Log Microlog

Consult your local Schlumberger engineer to determine the set of porosity logs which will give you an added "oil-finding" dimension.

THE EYES OF THE OIL INDUSTRY

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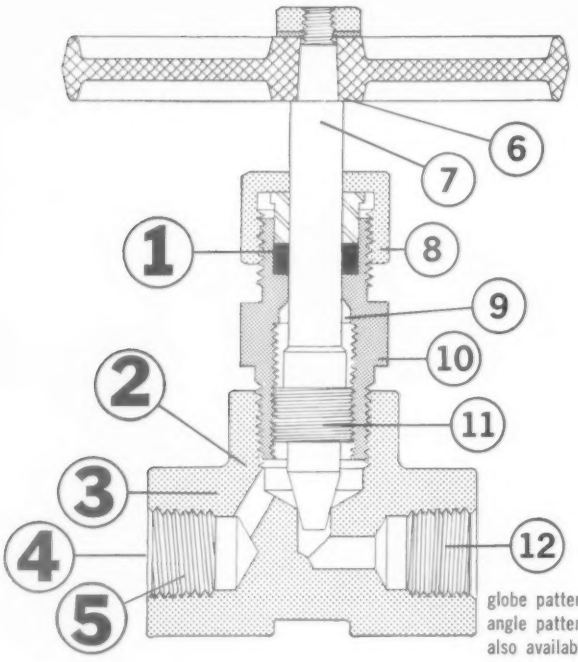
ENGINEERED FOR LONGER LIFE - -

1. Teflon Packing — self lubricating; gives longer life; permits higher operating temperature; resilient, will not take permanent set under pressure, eliminates retightening.
2. Forged steel body — A-105-II steel.
3. Phosphate coating — clean, overall protection.
4. Individually inspected — each valve cleaned of chips and foreign matter.
5. Pipe threads — leak proof; threads accurately cut and double-checked by Army-Navy gaging practice.
6. Handle — precision fit to stem.
7. Stem — extra-heavy #303 stainless steel; ground to close tolerance.
8. Sealant on Gland Nut — permanently tight.
9. Upper Seat — allows repacking under pressure while valve is in use.
10. Bonnet — power tightened so it cannot be accidentally disassembled.
11. Stem Thread — lubricated to prevent galling.
12. Pipe Openings — precision aligned for easy makeup.

NOW... every fine quality in one needle valve.... globe or angle pattern.



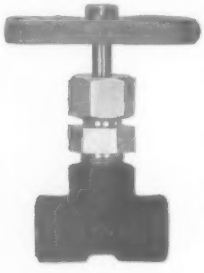
globe pattern-angle pattern also available

This new needle valve was made to **reduce maintenance**

Long, trouble-free life has been engineered into this CAPITOL forged steel needle valve.

Intensive study of forged steel needle valves in service showed the vulnerable points. CAPITOL combined proven design, quality materials and careful workmanship to produce a *superior* needle valve.

Packing problems are eliminated with miracle Teflon, recommended for temperatures to 450° F. Tight connections are assured by more pipe threads, double checked by Army-Navy gaging practices. All 12 major features, listed at the left, combine to insure worry-free service.



Service: Engineered for service in chemical, petrochemical and allied process industries. *Pressure Rating:* 5000 psi at 70°F. *Testing:* Each valve leak-tested at 100 psi; custom-testing to 10,000 psi upon request. *Sizes:* ⅛" thru ½".

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SPECIFY CAP FOR ALL FITTINGS

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CAPITOL

BY W. L. NELSON, Technical Editor and Petroleum Consultant

What's the price tag on

Higher product quality and improved refinery efficiency?

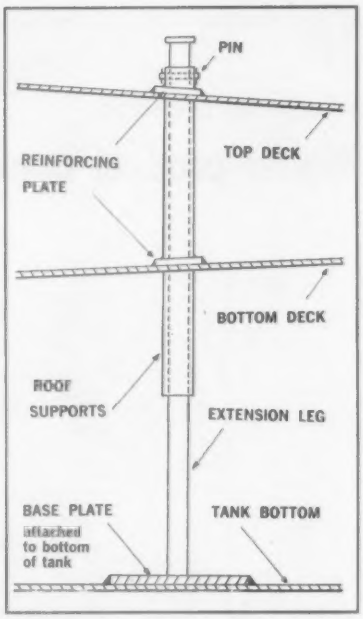
Year†	Refinery cost, $ per bbl. L.O.	Refinery cost, $ per bbl. Lube	Innovation	Percentage of crude cap. involved: By process L.O.	By process Lube	Of industry	Total* L.O.	Total* Lube	Cost of process, $ per bbl. 1946	Cost of process, $ per bbl. Date	Improvement cost, $ per bbl. of crude L.O.	Improvement cost, $ per bbl. of crude Lube	Per cent of new plant cost L.O.	Per cent of new plant cost Lube
1890	$90	$320	Shell-still battery	100	50	100	100	50	‡$65	$19.50	$19.50	$9.75	21.60	3.05
1890	90	320	Rerun after acid (L.O.)	25	25	75	37	37	*50	15.00	5.55	5.55	6.18	1.74
1891	...	330	Pressing and sweating	...	15	90	...	13.5	‡280	84.00	...	11.30	...	3.42
1896	100	380	Frasch desulfurization	35	30	40	14	12	‡80	20.00	2.80	2.40	2.80	0.63
1900	...	410	Cold settling	...	25	60	...	15	‡500	125.00	...	18.75	...	4.57
1905	130	455	Steam reduction (incl. power)	50	80	100	50	80	‡30	7.50	3.75	6.00	2.88	1.32
1910	150	490	Still coking	20	...	20	4	...	‡90	24.30	0.97	...	0.65	...
1910	150	490	Sediment still	100	80	70	70	56	‡6	1.62	1.13	0.91	0.75	0.18
1912	...	505	Wax molding and chipping	...	5	100	...	5	‡50	14.50	...	0.73	...	0.15
1915	...	530	Percolation¶	...	30	100	...	30	500	120.00	...	36.00	...	6.80
1915	175	530	Doctor sweetening	35	35	100	35	35	10	2.40	0.84	0.84	0.48	0.16
1915	175	530	Burton stills, etc.	45	20	80	36	16	300	72.00	25.90	10.50	14.80	1.98
1915	175	530	Towers on stills	100	100	80	80	80	65	15.60	12.50	12.50	7.15	2.36
1916	185	545	Compression gas recovery	35	...	50	17.5	...	10	4.05	0.71	...	0.38	...
1922	...	720	Centrifuge dewaxing¶	...	20	100	...	20	1,000	505.00	...	101.00	...	14.05
1922	265	720	Clay treatment—L.O.	40	40	90	36	36	20	10.10	3.96	3.96	1.49	0.55
1922	265	720	Continuous doctor sweetening	40	40	80	32	32	15	7.56	2.42	2.42	0.91	0.34
1923	275	735	Absorption gas recovery	30	15	90	27	13.5	33	20.30	5.48	2.74	1.99	0.37
1925	...	690	Clay burners	...	30	80	...	24	300	219.00	...	52.50	...	7.62
1925	290	690	Reaction chamber cracking¶	40	20	100	40	20	200	146.00	58.50	29.20	20.20	4.25
1925	290	690	Power—two-stage steam¶	§130	§500	30	§39	§150	1.75	1.28	50.00	192.00	17.30	27.80
1928	...	610	Clay contacting	...	30	50	...	15	300	213.00	...	31.90	...	5.23
1928	295	...	Desulfurization of gases	30	...	50	15	...	17	12.10	1.82	...	0.62	...
1928	295	610	Hypochlorite treating	20	20	25	5	5	10	7.10	0.36	0.35	0.12	0.06
1928	295	...	SO_2 treating—L.O.	30	...	20	6	...	350	249.00	14.95	...	5.06	...
1929	290	...	Tetraethyl lead	30	...	90	27	...	19	13.50	3.64	...	1.25	...
1930	...	575	Vacuum lube stills¶	...	45	80	...	36	100	70.00	...	25.20	...	4.39
1930	280	575	Gray vapor phase treating	20	15	50	10	7.5	25	17.60	1.76	1.32	0.47	0.23
1930	280	575	Stabilizers	30	25	80	24	20	33	23.20	5.56	4.64	1.66	0.81
1930	280	...	Gyro vapor phase cracking	30	...	10	3	...	175	123.00	3.69	...	1.32	...
1930	280	575	Thermal reforming	15	20	80	12	16	200	141.00	16.90	22.60	6.03	3.94
1930	280	575	Pipe stills and crude towers¶	100	100	100	100	100	40	28.00	28.00	28.00	10.00	4.87
1931	275	570	Continuous rerunning	10	30	80	8	24	40	26.00	2.08	6.24	0.76	1.09
1932	265	...	Destructive hydrogenation	30	...	1.5	0.45	...	3,600	2,060.00	9.25	...	3.48	...
1932	265	...	Thermal polymerization	4	...	10	0.4	...	600	342.00	1.37	...	0.52	...
1932	265	550	Inhibitors¶	35	30	100	35	30	2	1.14	0.40	0.34	0.15	0.06
1932	265	550	Delayed coking¶	20	10	20	4	1	256	146.00	5.84	1.46	2.20	0.27
1933	...	535	Solvent extraction¶	...	30	90	...	27	400	228.00	...	61.60	...	11.53
1933	260	535	Continuous treating	45	40	100	45	40	15	8.55	3.84	3.42	1.48	0.64
1935	260	530	Propane recovery¶	10	10	100	10	10	33	20.70	2.07	2.07	0.80	0.39
1935	260	530	Polymerization cata.¶	3	2	100	3	2	670	420.00	12.60	8.40	4.85	1.60
1935	...	530	Solvent dewaxing, etc.	...	20	100	...	20	700	439.00	...	87.80	...	16.60
1935	260	530	Copper chloride sweetening	25	15	40	10	6	20	12.56	1.26	0.76	0.48	0.14
1935	260	530	Tubestill cracking¶	40	25	100	40	25	175	110.00	44.00	27.50	15.90	5.20
1935	260	...	Asphalt by pipe still	15	...	20	3	...	45	28.20	0.85	...	0.33	...
1935	260	530	Power hp.	§128	§365	40	§51	§146	1.85	1.16	59.00	169.00	22.70	32.00
1936	270	...	Oven coking	10	...	2	0.2	...	350	235.00	0.47	...	0.17	...
1937	280	570	Desalting	100	100	100	100	100	4	2.98	2.98	2.98	1.06	0.52
1939	300	620	Combination topping	100	100	50	50	50	10	7.66	3.83	3.83	1.28	0.62
1939	300	620	Houdry catalytic cracking	30	20	15	5	3	400	307.00	15.35	9.20	5.12	1.48
1939	300	620	Viscosity breaking	20	10	80	16	8	100	76.60	12.30	6.15	4.10	0.99
1940	310	640	Bauxite desulfurization	10	10	50	5	5	80	61.30	3.06	3.06	0.99	0.48
1941	330	660	Caustic extraction L.O.	30	20	40	12	8	40	32.00	3.84	2.56	1.16	0.39
1941	330	660	Tubestill cracking (more)	30	20	67	20	13	175	140.00	28.00	21.00	8.50	3.18
1943	360	...	Alkylation	4	...	50	2	...	750	652.00	13.00	...	3.60	...
1943	360	700	Isopentane and hydrocarbons	20	10	50	10	5	100	87.00	8.70	4.35	2.42	0.62
1944	375	750	Butadiene	...	...	...	...	...	210	178.00	10.15	...	2.80	...
1945	395	785	Catalytic cracking¶	40	30	40	16	12	275	248.00	40.00	30.00	10.00	3.90
1945	...	785	Solvent deoiling¶	...	3	50	...	1.5	800	720.00	...	10.80	...	1.38
1949	500	1,050	Power—three-stage	§124	§325	40	§50	§98	1.95	2.73	136.00	266.00	27.20	25.30
1949	500	1,050	Vacuum flashing	50	30	50	25	15	40	56.00	14.00	8.40	2.80	0.80
1950	530	1,100	Visc. breaking (more)	15	10	80	12	8	100	146.00	17.50	11.20	3.30	1.02
1950	530	...	Propane, etc., decarbonizing	25	...	20	5	...	350	510.00	25.40	...	4.80	...
1951	550	...	Ethylene	...	...	...	§1.4	...	19.30	30.00	42.30	...	7.70	...
1952	690	1,410	Reforming, catalytic¶	20	20	60	12	12	400	654.00	78.50	78.50	11.35	5.55
1952	690	...	Butadiene (more)	...	...	...	...	...	180	295.00	18.50	...	2.68	...
1952	690	...	Airlift catalytic cracking	30	20	10	3	2	300	490.00	14.70	9.80	2.13	...
1953	710	1,460	Catalytic cracking (more)	50	40	40	20	16	275	478.00	95.50	76.40	13.90	5.24
1953	710	...	Continuous coking	15	...	10	1.5	...	300	520.00	7.80	...	1.10	...
1953	710	...	Aromatics	...	...	...	0.104	...	15,000	26,000.00	27.30	...	3.70	...
1954	730	1,540	Hydrodesulfurization	20	20	45	9	9	90	162.00	14.50	14.50	2.00	0.94
1955	800	1,620	Catalytic reforming (more)	20	20	40	8	8	400	735.00	58.70	58.70	7.33	3.81
1955	800	1,620	Alkylation¶	6	3	50	3.5	1.6	650	1,200.00	36.00	19.20	4.50	1.16
1955	...	1,620	Wax molding¶	...	3	20	...	1.5	150	276.00	...	4.14	...	0.26
1956	850	1,720	Inhibitor sweetening¶	25	20	50	12.5	10	2	3.92	3.92	3.92	0.46	0.22
1959	920	1,830	Hydrodesulfurization (more)	20	15	35	7	5.2	130	289.00	20.20	15.00	2.20	0.82
Total for 81 years													296.30	229.12

*No credit is given for the utilization of existing refinery equipment because such usage will be accounted for an obsolescence cost. †Data of widespread application. Change of the date scarcely affects the percentage of investment because the cost of refineries and the innovation process rise or fall together. ‡Estimate. §Pounds per bbl. ¶Also caused losses by obsolescence.

TRANSITION from old to new: angle-iron supports have been removed. New supports will raise the roof height from 5½ ft. to 6½ ft.

On the Job
PIPELINING

How to modernize old floating-roof tanks



NEW SUPPORTS will hold the roof this way in high position. Drawing shows cut-away of pontoon section of the roof.

A 10-YEAR modernization and maintenance program by Great Lakes Pipe Line Co. will bring all of its old floating-roof tanks up to date in every respect.

The program, already under way, covers 134 tanks in refined-products service at nine locations, and will be handled by company maintenance gangs. When it is finished, the tanks will provide more efficient storage as well as improved safety and convenience for Great Lakes employes who work on them.

Here's what the program consists of:

- New shoes and seals for all of the tanks, and new canvas seal protectors where needed.
- Replacement of the steel ladders on the roofs of 120 floating-roof tanks with self-leveling stairways.
- Replacement of the pantagraph type of roof hangers on 120 of the tanks with pipe roof supports.
- Relocating the water-draw sump system in many of the tanks, as settling has resulted in water draws being situated in some instances away from the low points of tank bottoms, causing the tanks to carry excess water.
- Cleaning the bottoms of all tanks.
- Replacing the roof drains on 120 tanks where rust has deteriorated them.

The entire program will cost about $750,000; more than 80% of the total will be spent for shoes, seals, seal protectors, stairways, and pipe supports. Most Great Lakes tankage constructed in the past 15 years has been of the lifter-roof, cone-roof type. Conversion of the floating-roof tanks to the cone-lifter system was considered. This was rejected because of cost (five times the cost of the present program) and the desirability of floating roofs for jet fuel and for service involving rapid product turnover.

Tanks safer. Both the self-leveling stairways and the pipe roof supports will make the old tanks safer structures for Great Lakes employes. Company tanks built since 1950 have these modern features.

The self-leveling stairways are, of course, much easier and safer to climb than the old-type ladders. The stairways are much appreciated by gagers and testers who often descend from the top of the tank shell to the roof, whose position varies.

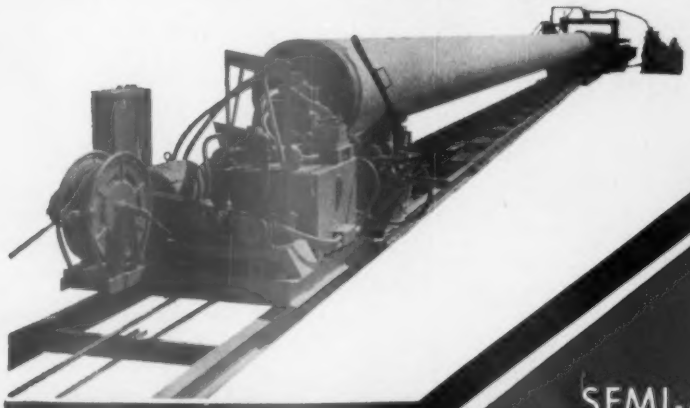
The pipe supports will permit lowering of the roof to 30 in. from the tank bottom when it is empty, and to 6 ft., 6 in. to provide working space to clean the tank.

Under the present arrangement, the roof is supported by angle irons at 3 ft. off the bottom when the tank is empty; for cleaning, the roof is suspended from the sides of the walls by hangers at 5 ft., 6 in. off the bottom. The hangers must be fastened to the roof each time they are used and are difficult to handle. Workmen have to stoop because of the low-hanging roof. The angle irons interfere with the cleaning operation. The pipe supports will eliminate these objections.

THIS IS HOW the self-leveling steps function on roofs. These steps replace old-type ladders.

NOW YOU CAN COAT AND WRAP PIPE EASIER—

FASTER — and at greatly reduced cost...



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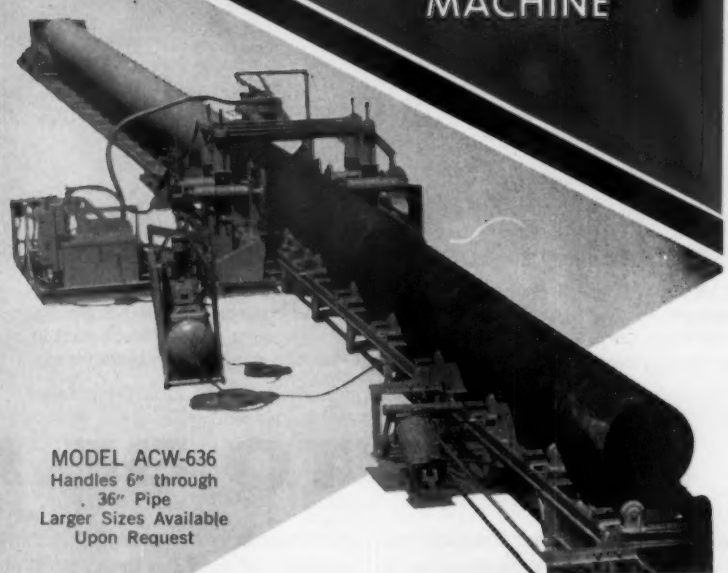
SEMI-AUTOMATIC STATIONARY COATING & WRAPPING MACHINE

COMPLETELY ELIMINATES PIPE COUPLERS (Come-Alongs)

- Cuts Operation Costs — Requires Only Five-Man Crew
- Designed for Continuous Heavy Duty Service
- Handles Larger Pipe Sizes Easier
- Quickly Adjustable to Different Pipe Sizes
- Automatic Feed-In Mechanism with Powered Input Conveyor
- Handles Crooked or Out-of-Round Pipe
- Hydraulic Powered

For complete details on how you can greatly reduce pipe coating and wrapping costs, write today for full information on the new Crose Semi-Automatic Stationary Coating and Wrapping Machine.



MODEL ACW-636
Handles 6" through 36" Pipe
Larger Sizes Available Upon Request

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ALL IN A DAY'S WORK—Turbocharged Thermodyne diesel-equipped Mack has power to spare for hauling the oil-field tractor being pulled down in the pipe yard of O. R. Burden Construction Corp. Company selected this Mack six-wheeler after 17-Mack fleet in Iraq and its domestic fleet proved unequaled in economy, durability and performance.

MACK
for over 6 straight years
NO. 1
by far in sales of diesel trucks

IT HAD TO BE MACKS!

"In September, 1959, our company was awarded a contract for construction of 317 miles of pipeline in Iraq," says Mr. J. S. Burden, president of O. R. Burden Construction Corp., Tulsa, Okla.

"After careful study of the hauling requirements for this project, and as a result of our domestic trucking experience, we chose Mack trucks over all competitive makes for our medium and heavy transport needs. We certainly made the right choice.

"We've found pipeline construction hauling everywhere is more efficient with Macks on the job . . . and their excellent performance overseas and in this country certainly influenced us in our latest purchase, a 72,000-lb. GCW Turbocharged Thermodyne® diesel-powered Mack B Model tractor," says Mr. Burden.

What are the reasons behind Mr. Burden's high opinion of Mack trucks? Some are: eight miles per gallon of fuel with full loads of pipeline construction equipment . . . minimum downtime despite the rigors of remote construction jobs in the United States and in the Persian Gulf area . . . and Macks' ability to stand up and come back for more regardless of terrain, weather or service.

You can have the most dependable, economical truck transportation, too. Simply call in your nearby Mack representative. When you've heard the full story, you'll agree "It has to be Macks!" Mack Trucks, Inc., Plainfield, New Jersey. Mack Trucks of Canada, Ltd., Toronto, Ontario.

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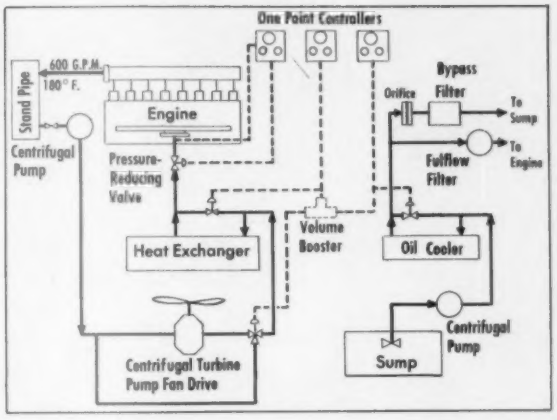
MACK
FIRST NAME FOR
TRUCKS



SCHEMATIC DIAGRAM of jacket water and fan drive system used in Florida system of Houston Oil & Gas line. (Fig. 1).

Novel cooling hikes efficiency of compressor stations

W. M. KAUFFMANN
Chief Engineer,
Compressor & Engine Division
Worthington Corp.

OVER-ALL EFFICIENCY of compressor stations on gas pipelines can be increased by refinements in the cooling system. This was proved by a novel system installed on the Florida division of the Houston Texas Gas & Oil Co. line from South Texas to Miami.

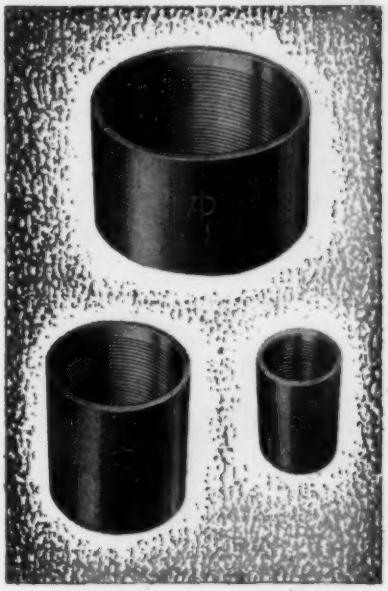
The 14-in. Florida section is powered by six 2,010-hp. turbocharged, high-compression, spark-ignition engines. Their efficiency has been stepped up as the result of the unusual cooling system developed by company engineers in cooperation with the engine builder, Worthington Corp.

Piping arrangement of the system is shown in Fig. 1. A view of one of the six engines is shown in Fig. 2.

How it works. Total engine jacket-water flow drives the heat-exchanger fan and then is returned to the engine inlet. The water temperature at pump outlet and turbine inlet is nominally that of the discharge water from the engine, or 180° F. The engine circulating pumps are chain-driven from the engine crankshaft at the auxiliary-drive end. The drive sprocket, mounted on a spring-loaded type of coupling prevents vibration transmission to the high-speed shaft.

A centrifugal pump, having a capacity of 600 g.p.m. and developing

VIEW of one of six 2,010 hp. turbocharged, high-compression, spark-ignition engines with unique cooling system. (Fig. 2).



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COUPLINGS

Harrisburg Seamless Steel Pipe Couplings are manufactured to A.P.I. and A.I.S.I. specifications for petroleum and other industries. The Harrisburg developed process assures uniformity of threading unsurpassed in accuracy of form, height, angle and lead. Order the best — order Harrisburg couplings.

More than a Century (H) in Harrisburg 6, Pa.

HARRISBURG STEEL CO.
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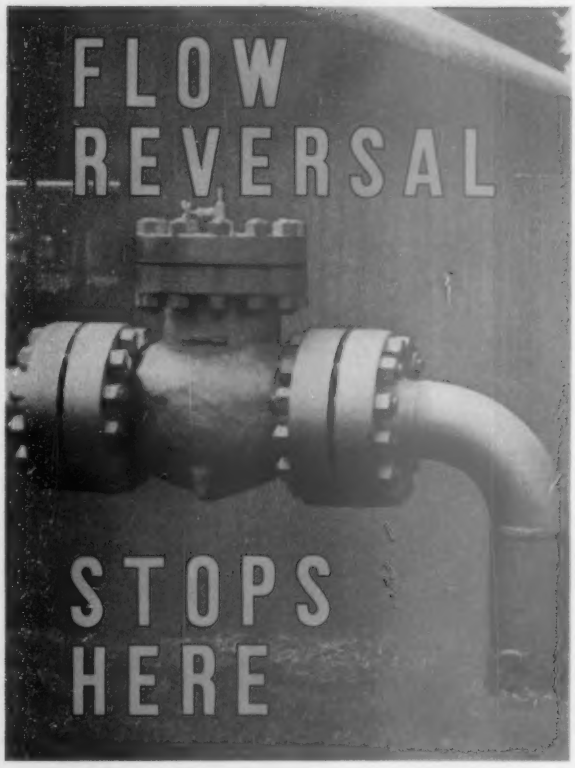
CYLINDERS

FLANGES

TUBES

TRANSPORTS



Line back-surge is prevented by a positive, non-slam shut-off of the Daniel piston-controlled check valve. The "floating" piston rides well above the valve seat with line surges, eliminating chatter. Safely handles compressor and pump discharges, steam, gas and vapor flows.

A.S.A. pipeline, refinery and general use valves, 1″ - 16″, up to 6,000 p.s.i.g.

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Easy-to-Handle Balance

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HEAVY-DUTY
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give faster, straighter cuts

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You'll Want a RIDGID 4-Wheel Pipe Cutter for Work in Tight Places!

Call your Distributor today. For your convenience, he maintains a complete stock of RIDGID Work-Saver Pipe Tools and parts!

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a total dynamic head of 220 ft. is driven from the high-speed shaft at 1,750 r.p.m. The total flow at 600 r.p.m. passes through a 6-in. header to a jacket-water turbine. Rated output of the unit is 15 hp. at 1,750 r.p.m. with a differential head at the turbine of 130 ft. water pressure.

Jacket outlet water passes to a standpipe for aeration and from this chamber to pump suction. The water discharged from the turbine passes through a three-way regulating valve to the heat-exchanger inlet. The regulator is automated by a one-point controller to set the proper fan speed and to maintain constant jacket-water outlet temperature.

A second butterfly regulating valve is placed across the inlet and outlet piping to the heat exchanger. This regulator functions to bypass water flow around the fin fan unit and maintain correct maximum jacket temperature. This is operated also by means of a one-point controller. The outlet water from the heat exchanger blends with the bypass flow, if any, and returns to the engine-inlet manifold through a pressure-reducing valve. Normal jacket-water pressure of 10 psi. is maintained during constant load and rated speed operation.

Aftercoolers used. Consistent with current practice for high-output spark-ignition gas engines, the power units are equipped with aftercoolers. These cool the discharge air from the turbocharger blower, reduce the mean cycle temperature, and establish the load point under the knock limit, so that performance at rated load is completely free of detonation. The aftercooling system is independent of the jacket-water circuit and handles only the heat-rejection load of the aftercooler and compressor-oil cooler.

The engine lubricating-oil system operates on the dry-sump principle, that is, all the oil drains from the engine base to an external sump tank. Following the sequence of operation, oil drawn from the tank by the engine-driven gear type of pump passes through the oil cooler to a full-flow type of filter, returning to the engine through a strainer element.

INCREASE PRODUCTION at LOW COST!

Clean up injection and producing wells!

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REG. U.S. PAT. OFF. INC.

P. O. BOX 9506
OKLAHOMA CITY, OKLAHOMA

Natural gas provides power for cathodic protection of line

NATURAL GAS is being used as the fuel for a thermoelectric generator to provide electric power for the cathodic protection of a natural gas pipeline. It is still in the experimental stage but initial tests have been sufficiently successful to warrant further work.

Northern Illinois Gas Co. has initiated the use of the fuel cell or thermoelectric generator for this purpose. Its first installation used a small, ten-watt unit manufactured by Minnesota Mining & Manufacturing Co.

The unit is producing power for a rectifier on the Northern Illinois system. This use is believed to be the first commercial application of the principle of thermoelectric generation in this country.

L. E. Nichols, Northern Illinois corrosion engineer, is in charge of the project. The next step involves the use of a 20-watt unit and it, in turn, will be followed by the use of a 100-watt unit now on order.

. . . one of a series presented by Western Supply Company, Tulsa, to improve the "I. Q."* of engineers . . . (*"Income Quotient")

IMPACT A RESULT OF CONTACT: PUBLIC SPEAKING NOT AN END, BUT A VITAL MEANS TO AN END

There certainly is no better tool in developing executive or management qualifications than through public speaking. Spoken words are a powerful tool of business. They are used to organize, motivate, coordinate, control, and train.

Since an executive must achieve results through people, he must be able to plan and organize. As a leader, he must be able to motivate and inspire people to action; he must make himself understood. He must have purpose and the will to make other people aid that purpose.

A speaker, too, achieves his results through people. He, too, must be able to plan and organize; must lead; must be able to motivate and inspire others to action; must make himself understood. The speaker must have a purpose and the will to make others aid that purpose. The skills of the executive are identical with those of a speaker, in these areas.

It is not surprising, then, that aspiring leaders in business and industry are judged by their associates and superiors by their abilities to communicate, to a great extent. It is not surprising that an executive can sell himself, can attain greater authority by broadening his capacities for directing and leading, through oral communication.

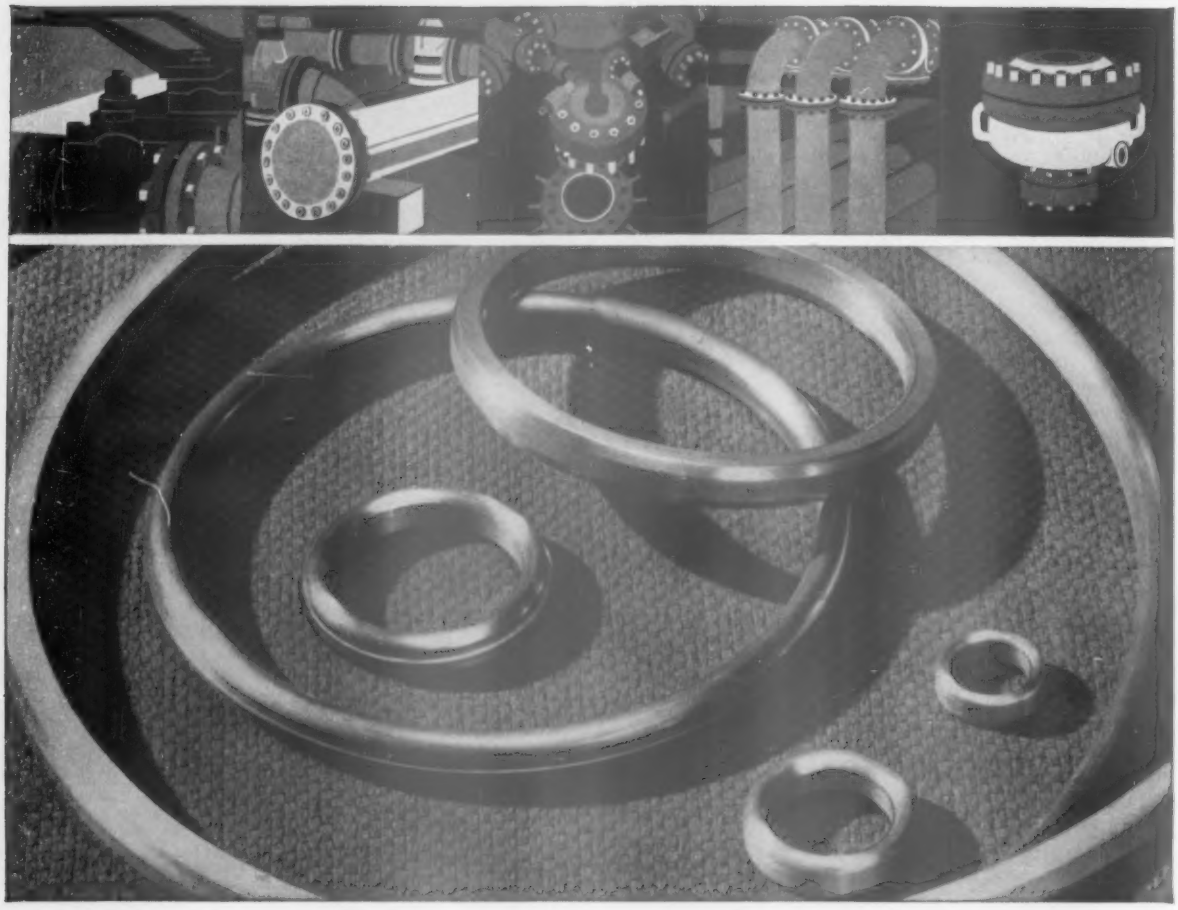
Words have great power, particularly the spoken word. Words give you contact with other men, and if you use them effectively, they give you—*impact*. That impact is multiplied as you develop your ability to speak, and as you speak to more important audiences.

If you are a novice in public speaking you are not alone. No more than 25 per cent of our speakers could qualify as "veterans."

Like conversation, speaking before an audience is based on sincerity and belief. It involves conviction and concern. The public speaker is most convincing when he is least artful, when he is most natural, and above all, when he is sincere.

Effective speaking is not an accident. It is not the special endowment of a few. While talking before many listeners may come naturally for a few, it is, by and large, a learned art. It consists of an idea, phrased simply, and delivered with conviction and with an expressive voice.

FOOTNOTE: the foregoing paragraphs are a direct quotation from another of Western's "personal-professional development" series. Booklet E-8, titled "Public Speaking: Impact A Result of Contact" a copy of which is yours upon request, without obligation. Write to WESTERN SUPPLY COMPANY, HEAT EXCHANGER DIVISION, P. O. Box 1888, Tulsa, Okla. — **where supervision contributes greatly to the manufacture of heat exchangers of the highest quality, and where personal attention to detail is our watchword.**



Get safer, surer sealing in ring-grooved joints with J-M V-TITE® GASKETS

YOU WILL BENEFIT BY CHOOSING THE GASKET PROVED IN SO MANY APPLICATIONS!

If you are concerned with the design or maintenance of ring-type joints, it will pay you to insist on the tighter, more efficient and longer-lasting seal you get with J-M's V-Tite design. Many equipment builders install these outstanding gaskets, and if it's your job to keep this equipment operating at top efficiency, here's a good point to remember: the gaskets that are right to *start* with . . . are right to *stay* with.

V-Tite Gaskets are "right" because every step in their manufacture is meticulously performed. Close tolerances are rigidly maintained for matching of rings with flange grooves. Carefully-controlled annealing keeps gasket hardness well below flange hardness . . . to assure proper flow and sealing without damaging the flange surfaces. Contact surfaces are smoothly finished . . . with no ridges, no tool or chatter marks that cause joint leakage.

J-M produces a wide selection of custom-designed and standard gaskets in any material, dimension or cross-section you require . . . including the new pressure-actuated BX Ring Gasket for extreme pressure service up to 15,000 psi at temperatures up to 250 F.

Complete information from your J-M Distributor. Or write to Johns-Manville, Box 14, New York 16, N.Y. In Canada: Port Credit, Ontario.

JOHNS-MANVILLE

V-Tite Gaskets meet API specifications

▶▶▶ New Equipment Section

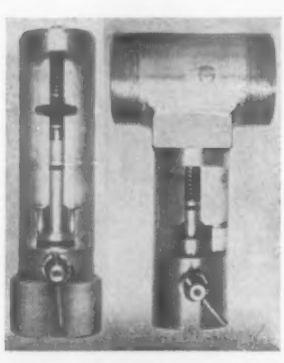
This week's SHOWCASE features . . .

New beam type of pumping unit

. . . features an integrated-truss type of construction designed to maximize rigidity and sustain the dynamic loads at the crankshaft and saddle bearings while minimizing displacement from the bearing centers. The maker says the loads originating at these bearings are as nearly directly connected as practicable by structural members loaded in straight tension.

Other features cited for the Series 60 pumping unit include a three-leg samson post constructed of wide-flange beams, and a servicing platform located so operators can conveniently adjust the counter-balance, remove wrist pins, and check the speed-reducer oil level. Made of expanded-steel, the platform fits between the cranks and between the front and rear samson-post legs. An inspection ladder mounted on the front of the unit gives access both to the saddle bearing and to the servicing platform.

As shown in the lower right, the unit is designed so the truss structure knocks down into single-beam sections which permits compact packaging. When knocked down and arranged for crating, a size 114 unit measures 16 ft. 5 in. long, 6 ft. 2½ in. wide, and 3 ft. 8½ in. high. Source: **Bethlehem Steel Co., Supply Div., 21 E. 2nd, Tulsa, Okla., U.S.A.**



Added safety for engines

. . . is promised by two new safety devices now on the market. Tradenamed Schafer Oil & Heat Sentinels, they are designed to shut an engine down either when lube-oil pressure drops below a set value or when lube-oil temperature rises above a set temperature.

Two models of the Oil Sentinel to fit any engine are available: one for liquid-fueled and one for gas-fueled engines. In both models, lube-oil pressure moves a piston inside a cylinder up against a spring. This lets fuel flow to the engine. When oil pressure falls below spring pressure, the piston moves down and shuts off the engine fuel supply. Total piston movement is ⅜ in.

The liquid-fuel model is bracket-mounted and comes with ⅜-in. tapped holes for fuel lines. The gas-fuel model comes ready for installation of 2-in. fuel lines and is line-supported. Thus no bracket is needed. Other line sizes can be accommodated by swedging.

Dimensions of the oil-fuel model are: height 7 in., and diameter 2 in. Weight is 3 lb. Pressure springs for both models are factory-installed and come in ratings from 5 to 30 lb. All units are factory-tested to 125 psi. to assure that no oil will pass the seals into the fuel supply.

The Heat Sentinel, installed in the engine water jacket, is designed to work with the Oil Sentinel or separately. When oil temperature reaches a set temperature, either 200° or 212° F., a thermal expansion unit raises a ball valve in a cylinder. This releases lube-oil pressure in the Oil Sentinel, and lets the piston drop and shut off engine fuel. The Heat Sentinel is threaded on the bottom end and

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to manufacturer at address shown in bold type after each item.

Product name, Model no., literature title or number: .....

Described in OIL AND GAS JOURNAL - Issue of **March 6, 1961**

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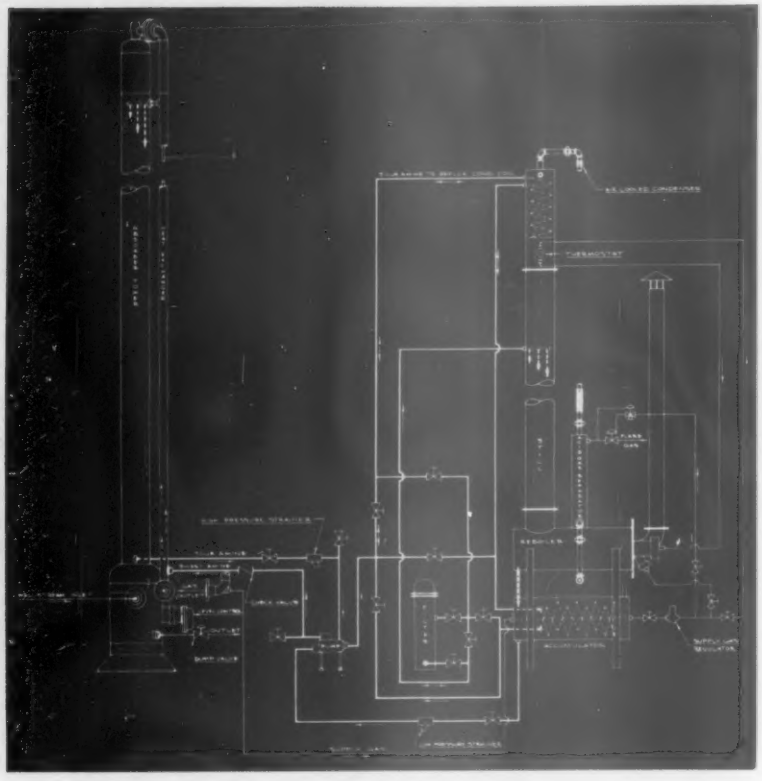
Sweeten Sour Gas More Economically



With Maloney-Crawford's New Sweet-A-Mine Units

Maloney-Crawford technology has made low-cost, highly efficient amine desulfurization a reality with its new Sweet-A-Mine units. Whether you have 400 MCF/D or 50 MMCF/D of sour gas, a Sweet-A-Mine will give you specification gas . . . and with virtually no field attendance. The diagram above shows a quick payout Sweet-A-Mine unit designed for streams up to 4 MMCF/D, having 250 grains H_2S or less per hundred cubic feet and little CO_2, and an average inlet gas temperature of about 80 degrees F. It is compact and requires no water cooling. It absorbs the sour gases in a solution of monoethanolamine in water, then regenerates the sour amine solution for reuse. A special feature is a reflux condensing coil that boosts the efficiency of the regenerating process.

In light of these advances, re-examine your sour gas problem. Tell us your conditions and our engineers will propose a solution. No obligation, of course.

MALONEY-CRAWFORD
TANK & MANUFACTURING CO.
P. O. BOX 659 TULSA, OKLA.

comes in two sizes: ½ and ¾ in. Source: **Happy Co., Drawer 770, Tulsa 1, Okla., U.S.A.**

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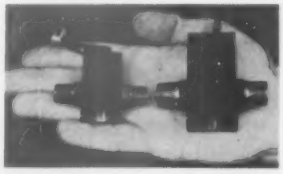


Miniature three-way valves

. . . can be obtained now with male pipe connections which turn, permitting installation without the added expense of unions, according to the maker of these Micro Valves.

Other features claimed for the valves include: (1) fast, positive snap-action, (2) suitability for operating pressures up to 100 psi., (3) long life and realiability even when handling dirty or abrasive materials, (4) available in a variety of orifice sizes, materials, and types of operators, and (5) two or more valves may easily be manifolded together for multiple operation. Source: **Instruments, Inc., P. O. Box 566, Tulsa, Okla., U.S.A.**

•

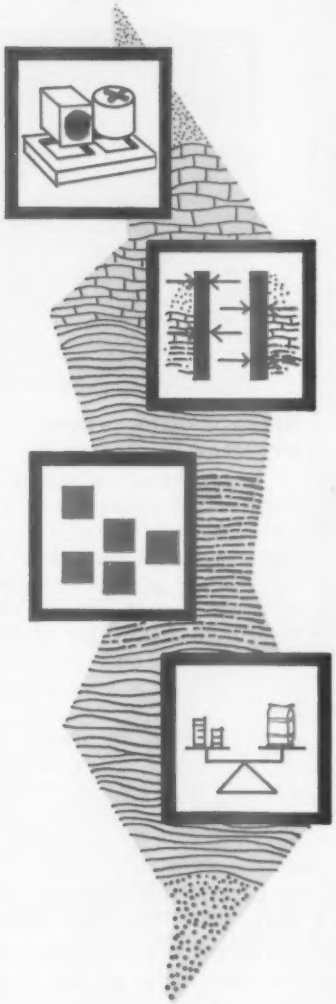
Fast storage-tank welding

. . . is promised by this Circomatic automatic seam-welding assembly recently demonstrated in England. The unit is designed for high-speed shielded-arc welding of the girth seams on large storage tanks.

Seams can be welded 10 times faster with the equipment than by older means, the maker claims. Too, because of the deep penetration obtained, no chamfering of the plate edges is needed on plates up to ⅜ in. thick. Back gouging is also unnecessary.

MUD WEIGHTING MATERIALS MAY LOOK ALIKE... BUT TESTS SHOW

BAROID* PERFORMS BETTER



All barium sulfate mud weighting materials look and weigh about the same, but they perform differently. Each mud company sets its own standards of quality. BAROID sets the highest standards.

These differences in standards can mean added expense to control the three basic properties of drilling mud: weight, filtration and flow properties.

One brand of weighting material may give your mud twice or three times as much gel strength, viscosity or filtrate loss as another brand. WHY TAKE CHANCES? *Use* BAROID, *the winner in performance!*

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Combine your Couplings, Welding Fittings, Flanges, Swage Nipples and Bull Plugs, Pup Joints, Sub Nipples, Sub Couplings, Weld Reducers, Caps and Saddles on one purchase order and take advantage of prepaid freight or freight allowance. Freight prepaid on combined shipments of 500 lbs. or more of the above items to one destination.

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MILLS IRON WORKS, INC.
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OSECO Silvertop Fusible Plugs with renewable inserts for all types OIL COUNTRY BOILERS.

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Volcano Superior and Gulf States All Steel Gas Burners for OIL COUNTRY BOILERS.

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Stand lifts, holds, tilts 55 gal. barrels. Prevents spillage—easily loaded.

WHEELING MACHINE PRODUCTS CO.
Wheeling, West Virginia
XL Steel Pipe Couplings for OIL COUNTRY TUBULAR PRODUCTS.

HENRY H. PARIS DISTRIBUTOR, Inc.
OIL WELL, REFINERY AND INDUSTRIAL SUPPLIES
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Weighing about 3,360 lb., the assembly consists of two enclosed platforms, with an operator in each one. These are suspended on either side of the tank wall from an upper carriage. Equipped with grooved wheels, the carriage is motor-driven around the top edge of the tank plating at speeds from 10 to 100 in. per minute, or from 80 to 200 in. per minute.

Both platforms have power-operated welding arms with automatic welding heads in arc boxes supplied with carbon dioxide gas through an electromagnetically controlled valve. Source: **Rockweld Ltd., Commerce Way, Croydon, Surrey, England.**

•

Storage-tank vapor inverter

. . . that mounts on the pressure-relief vent of a storage tank is available which is designed to direct fumes and gases vented from a storage tank, as product is pumped in, high into the air. Thus it offers a way to protect personnel working on surrounding tank roofs and nearby ground areas from exposure to fumes.

According to the maker, the inverter does not impair the flow capacity of relief vents and is designed and tested for efficient operation even under snow and freezing conditions. It comes in sizes from 2 to 12 in. Source: **Johnston & Jennings Co., 350 Fifth Ave., New York 1, N. Y., U.S.A.**

•

Foaming agent for air drilling

. . . of wells troubled by water encroachment has been put on the market which is a liquid cationic

That's the amount of catalyst that Buell cyclones are collecting in fluid cat crackers every day . . . enough to build a pyramid the size of the Great Pyramid of Cheops. Operating experience has convinced refineries to rely on Buell Cyclone Systems for minimum catalyst loss. Buell systems for fluid bed processing include: fluid catalytic cracking units, hydroforming, coking, coal carbonization, iron ore reduction. To meet the most stringent air pollution codes refineries also prefer a combination system with Buell Electric Precipitators. Buell Engineering Company, Inc., Department 61-C, 123 William Street, New York 38, New York; Northern Blower Division, 6405 Barberton Avenue, Cleveland, Ohio. Cyclones • Electric Precipitators • Bag Collectors • Combination Systems • Classifiers • Fans

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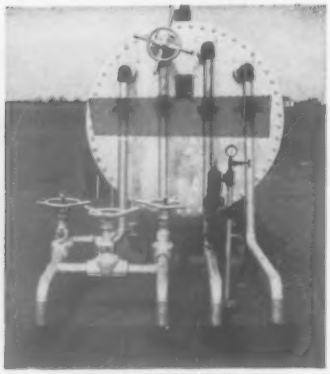
WECO UNIONS



Heater Hook-up with WECO Unions

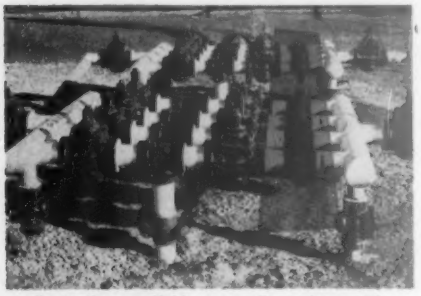
Blowout preventer control lines with WECO Unions and Chiksan Joints

ARE EVERYWHERE IN THE OIL INDUSTRY

On the drilling rig you find them on mud suction and discharge lines . . . on fuel, steam and water lines . . . on stand pipe connections . . . blowout preventer hook-ups. You will find them, too, on service company trucks, lines and head connections in cementing, acidizing and fracturing operations.

Wherever there is production, WECO Unions are used in making up headers and manifolds; tank, heater, treater and separator installations; on flow lines, meter connections and wherever else unions are used for faster, more efficient piping. You will find them also on offshore rigs, platforms and production hook-ups—on water flooding and repressuring projects.

There is a WECO UNION of the right type, size and pressure rating for every service in every phase of the industry . . . and they are available from stock at Supply Stores everywhere.



Production manifolds are easily made-up with WECO Unions

U-3-61

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS
Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

WECO UNIONS · CHIKSAN SWIVEL JOINTS · HAMER LINE BLIND VALVES · HAMER PLUG VALVES · WECO AIR-O-UNION · WECO COMPOUNDS · WECO SNATCH BLOCKS

surfactant, tradenamed Armomist. It will produce large quantities of a stable, light-density foam and is not affected by the high concentrations of dissolved solids, the maker says. Too, it reportedly has corrosion-inhibiting properties and works well as a shale conditioning agent.

The product is a highly fluid substance with a pour point below 0° F. so that it can be used at extremely low temperature. It may be injected in the air stream either directly or in a carrying medium of lime water. Source: **Armour Industrial Chemical Co., 110 N. Wacker Dr., Chicago 90, Ill., U.S.A.**

●

Hydraulic-fracturing tool

. . . now available is a combination type designed to prepare a well bore for hydraulic fracturing by the V-notch method. Manufactured under license from Gulf Oil Co., the tool is an adaptation of the maker's hydraulic expansion two-blade wall scraper.

Notching a well bore with the tool requires two steps: First, the V-notcher, dressed with casing cutting blades, mills a 4½ to 6-in. ring through the casing. Next, after the casing blades have been replaced in the body on the rig floor with formation blades, the tool V-notches the well bore through this ring. Source: **Grant Oil Tool Co., 2042 E. Vernon Ave., Los Angeles 58, Calif., U.S.A.**

●

Chain drive for gas turbines

. . . developing 30 to 1,800 hp. is on the market. Applicable to main or auxiliary drives, the drives are capable of transmitting rotating power between parallel shafts at high speed, the maker says.

Tradenamed Hy-Vo (high velocity-involute sprocket), the chain is a refinement of the silent-chain

Trinity **Lite-Wate** Cement

has done what the operator set out to do in over 1500 wells in the past year.

HERE ARE THREE:

1

ECTOR COUNTY, TEXAS

Cemented 3,383 feet, 4½-inch casing. Slurry weight 12.5 to 12.7 pounds. Tailed in with 13-pound slurry. TRINITY LITE-WATE all the way. Job successful.

2

ST. CHARLES PARISH, LOUISIANA

Cemented 9⅝-inch surface casing in 15-inch hole, badly washed out. 12.5-pound slurry returned to 25 feet from surface, using 13.5-pound slurry for tail in. Nippled up after 12 hours... drilled out of 9⅝" in 26 hours... tested with 3500 lbs. per square inch. TRINITY LITE-WATE all the way. Job successful.

3

TERRELL COUNTY, TEXAS

Cemented 13,752 feet of 7-inch casing. Used TRINITY LITE-WATE cement 12.7-pound slurry with .8% LWL 20% Silica Flour. Brought cement back to 5,484 feet in one stage for fill up of 8,268 feet. Tailed in with INFERNO and 4% Gel. Job successful.

In the range of lightweight cement slurries, TRINITY LITE-WATE produces a slurry which is:

1. Sulfate resistant for lasting casing protection.
2. Remains impervious to migrating fluids.
3. Light enough to circulate.
4. Strong enough for any casing seat.
5. Strong enough to permit hydraulic fracturing.
6. Easy to mix, easy to pump.

TRINITY LITE-WATE can be used in most wells by just adding water. For special conditions it is compatible with accelerators, retarders, LWL agents and some other additives. For complete laboratory data call your local Trinity Representative or write Dallas Office, P. O. Box 2698 or phone RIverside 2-8111.

75 lb. Dry Volume per cubic foot

TRINITY

PORTLAND CEMENT DIVISION

GENERAL PORTLAND CEMENT COMPANY

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principle for extremely high speeds and heavy loads. It incorporates compensating links that are claimed to fully eliminte chordal action normally encountered at high chain speeds. Source: **Morse Chain Co., Ithaca, N. Y., U.S.A.**

●

Plastic guard for pump coupling

. . . can be obtained which the maker says weighs only about one-third that of steel guards, yet is corrosion-resistant, strong, and durable.

The coupling is made of glass-reinforced polyester or epoxy resin. Color is blended in the resin, so the guard will need no painting. The guard comes in four sizes. Source: **Armadillo Plastic Co., P. O. Box 13233, Houston 19, Tex., U.S.A.**

●

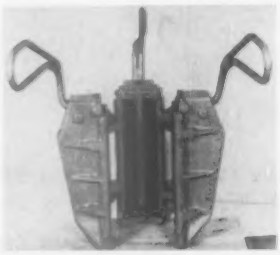
Analog-event recorder

. . . permits simultaneous measurement of such variables as pipeline pressure and valve operation and substation bus voltage and breaker operation. The maker says the instrument will accommodate any data which can be expressed as an a.c. or d.c. voltage or current.

In process plants, the event pens can chart the opening and closing of as many as six valves, while the analog pen will reveal what effect this has on pipeline pressure.

Measuring 10¾ in. wide, 16 in. high, and 11 in. deep, the instrument records the analog and event data on a 6-in.-wide strip chart. Analog information is recorded in the center 3 in. and event information on the margins. Source: **Esterline - Angus Instrument Co., 1201 Main, Speedway, Ind., U.S.A.**

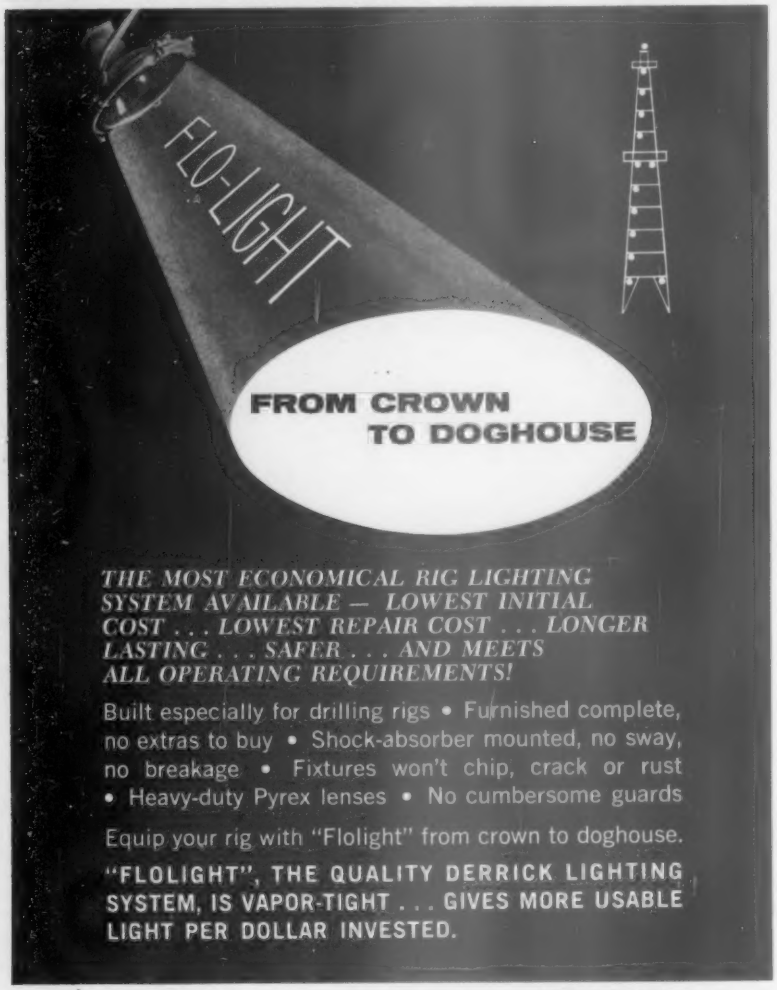
●



Newest rotary slip

. . . has flattened toes at the bottom of each of the three body segments so the Type B slip will stand solidly on the rotary table or derrick floor and thus prevent the need to lift and carry the slip around.

The slip is made of alloy steel using one-piece construction. It handles drill pipe and tubing sizes from 2⅜ to 4½ in. Source: **Woolley Tool & Mfg., Inc., Odessa, Tex., U.S.A.**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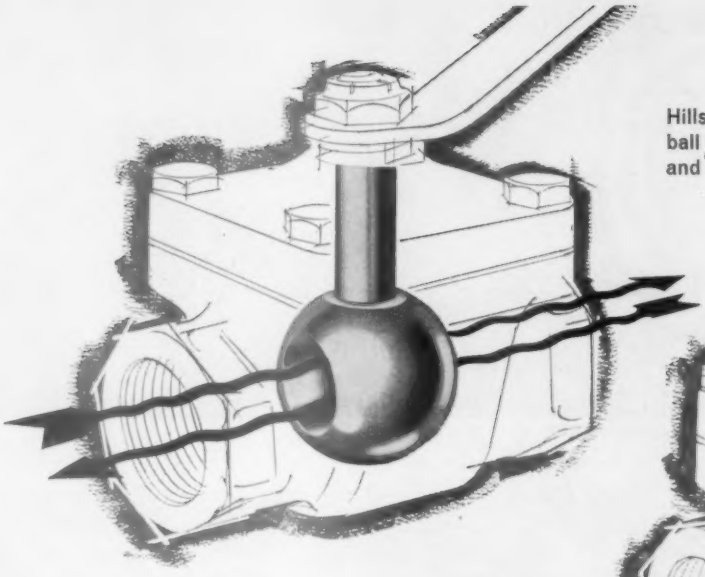
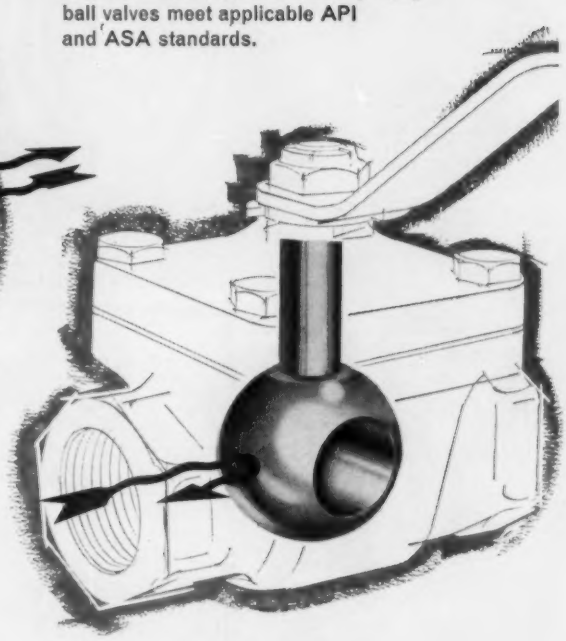


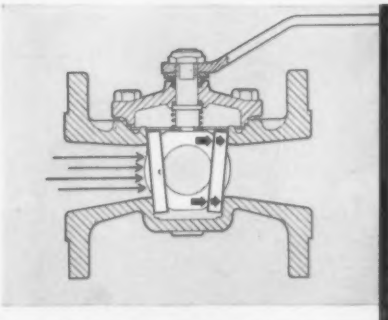
Hills-McCanna McCannaseal top-entry ball valves meet applicable API and ASA standards.



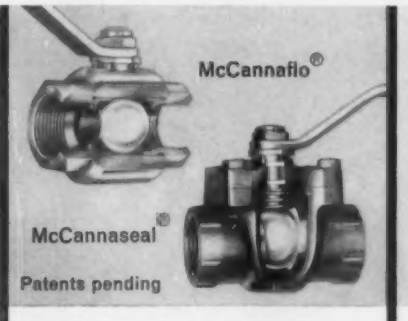
Ultra-simple design. The big orifice in the ball means minimum pressure drop. Double seats with floating ball provide two-way flow. Quick quarter-turn operation closes the valve.

Hills-McCanna Ball Valves

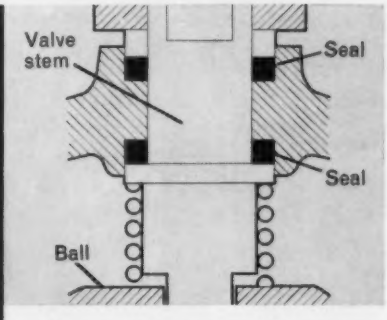
. . . the leaktight valves that end maintenance problems



Self-adjusting seats with leaktight pressure seal. McCannaseal seats move down into a wedge as wear occurs, maintaining tight contact with ball and body. Line pressure tightens the seal.



McCannaseal top-entry for in-line maintenance and McCannaflo for high-pressure lines. ¼" through 8" sizes, manual or motor-operated, screwed, flanged, or socket weld connections.



The stem is leaktight, too! Double seals are under compression by stem nut. Line pressure acts to further tighten and lower back-seated seal—the higher the pressure, the tighter the fit.

A complete line ¼" through 12" sizes for liquids, gases, vacuum . . . including models with high-temperature and fire-safe seats.

Ask for new catalog—32 pages of data on the newest, finest valves for corrosive and noncorrosive services—the valves that insure leaktight shut-off and end your maintenance problems. Write today, or call your Hills-McCanna distributor.

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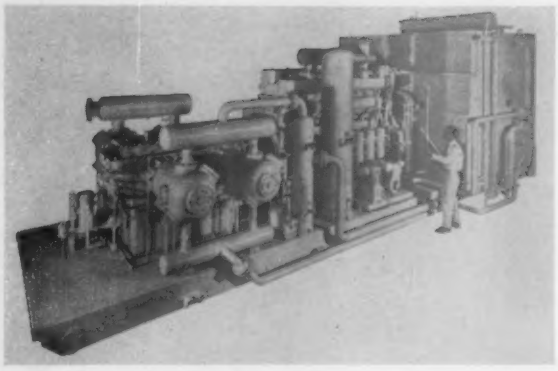
Jones & Laughlin Supply Division—Tulsa



Engine-compressor combination

. . . is now available for gas-gathering, gas-lifting, repressuring, and booster service in ratings from 200 to 1,000 b.hp. with operating speeds from 600 to 900 r.p.m. Both two-cylinder and four-cylinder compressors are available. Both have a 6-in. stroke. The compressors are designed for direct drive with the maker's natural-gas engines.

Sixty-eight standard cylinder sizes are available ranging from 2⅝ in. in diameter for a 4,000-psi. working pressure up to a 22½-in. diameter with an 85-psi. working pressure. Source: **White Diesel Engine Div., White Motor Co., E. 79th & Wallace Ave., Cleveland, Ohio, U.S.A.**

●

Mobile telephone equipment

. . . features a duplex dial system so a vehicles' receiver is operating as messages are being transmitted from the vehicle. It permits a vehicle driver to hear a wire-line party who cuts in during transmission of a message. Thus conversation may be identical to that with conventional telephone service.

Where direct-distance dialing service is available through telephone companies, a driver of a car equipped with the two-way dial mobile telephone will be able to place and receive calls to and from any part of the country without the services of an operator to route the call. Source: **General Electric Co., Communication Products Dept., Lynchburg, Va., U.S.A.**

●

Pneumatic dead-weight tester

. . . comes in pressure ranges up to 61 psi. The Model 750-A tester is said to be a precise primary pressure standard incorporating a virtually friction-free spherical piston. Application of calibrated weights is the only manipulation required during operation. Critical parts can be cleaned fast, the maker says. Accuracy is said to be 0.05% of output. Source: **R. J. Karr Co., 1605 16th, Wyandotte, Mich., U.S.A.**

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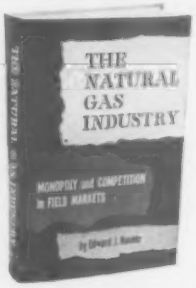

The Natural Gas Industry

Monopoly and Competition in Field Markets

BY EDWARD J. NEUNER

Is there a gas industry monopoly in field markets . . . or isn't there? Is it **really** necessary for prices to be regulated by the federal government?

Here is a detailed, impartial investigation of the most controversial public economic policy of our times . . . the requisite factual and analytical foundation upon which a rational decision could be made . . . for all who are concerned with the details of natural gas production and its regulation, control, and resulting price to customers.

THE OIL AND GAS JOURNAL
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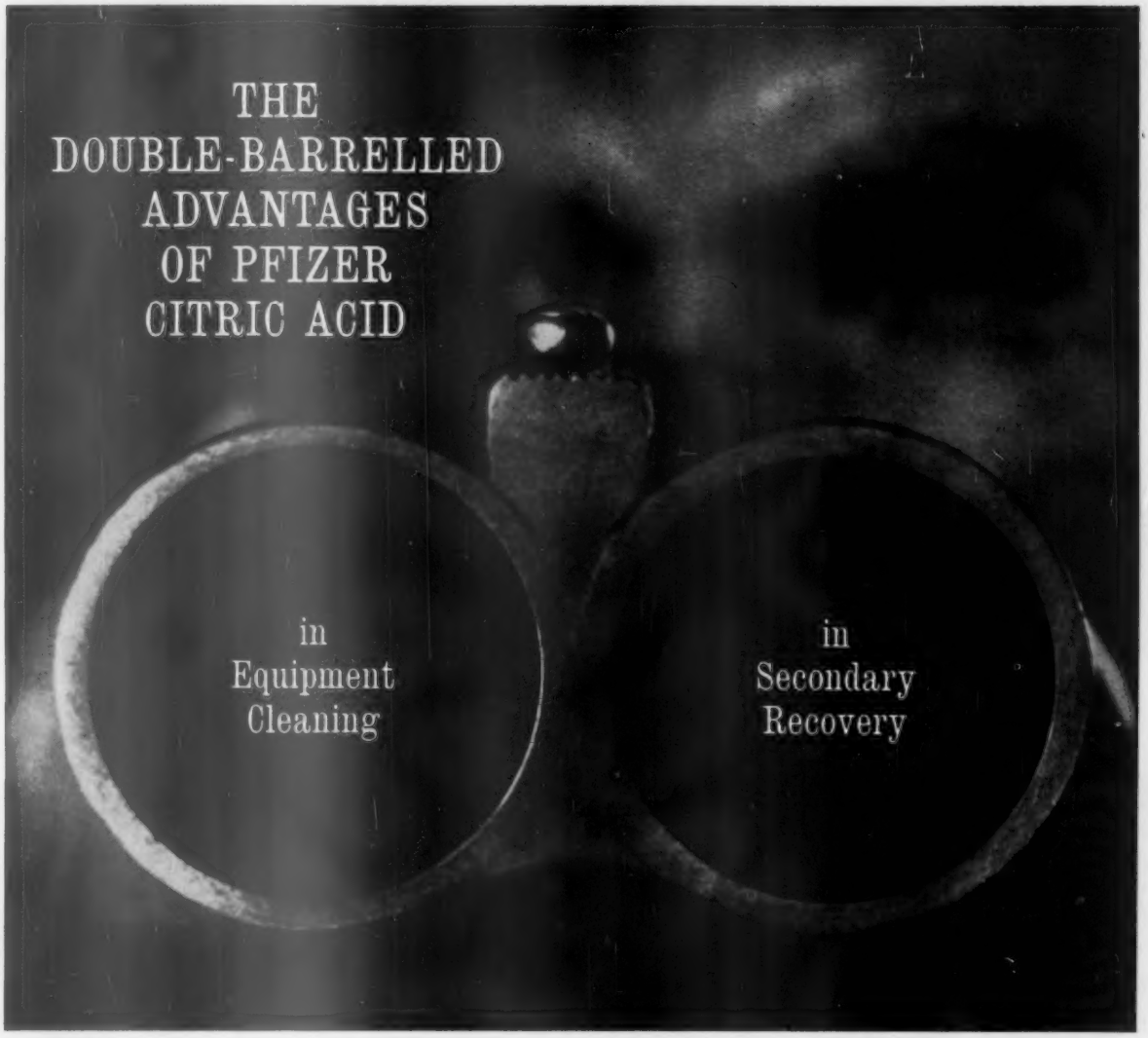

●● Pfizer Citric Acid today is rapidly becoming a more useful product for the petroleum industry. Not only is it an excellent chemical cleaning agent for petroleum refining equipment, but its long established use in secondary oil recovery continues to grow.

In cleaning petroleum refining equipment, citric acid effectively dissolves scale and corrosion deposits. Citric acid also prevents the reprecipitation of dissolved scale. It will not cause chloride stress corrosion cracking. Consult your chemical cleaning service company regarding these and other advantages of cleaning equipment with Pfizer Citric Acid.

●● In secondary oil recovery, Pfizer Citric Acid prevents sandface plugging caused by iron in the injection water. The results:

- higher injection rates
- lower injection pressures
- less frequent downtime on filters
- less replacement of parts due to rusting
- reduced frequency of costly acidizing or fracturing operations

Pfizer Citric Acid sequesters iron more efficiently and economically than any other chemical. It is non-toxic, water soluble and easily handled.

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☐ Technical Bulletin 102: "Pfizer Products for Chemical Cleaning"

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SHOWCASE . . .

New Literature

Flame-sprayed coatings

. . . save time and money, according to Report 3, which illustrates and describes how coatings are used to repair and improve worn parts. Applications throughout the industry include valve plugs and seats, pump rods, plungers, impeller blades and shafts, polish-rod liners, sucker-rod couplings, and tool holders. Also reviewed are the advantages of pure flame-sprayed zinc or aluminum coatings in the protection of equipment against atmospheric or salt-spray corrosion for maintenance-free service measured in decades. Source: **Metco Inc., 1101 Prospect Ave., Westbury, L. I., N. Y., U.S.A.**

Distillate treating

. . . for refiners is discussed in a booklet which gives a detailed description of Petreco Electrofining processes used to treat distillates and middle-range oils, along with the Bender catalytic-sweetening process for distillate treating. Interspersed throughout the booklet are photographs, photomicrographs, drawings, charts, tables, and diagrams. Source: **Petreco Div., Petrolite Corp., 3202 S. Wayside Dr., Houston 1, Tex., U.S.A.**

Valves for water flooding

. . . secondary recovery, and other pressure-maintenance systems are discussed in new eight-page Catalog 14-J1 recently issued. Water-flood valves, in both plastic-coated and noncoated models, include globe, check, resilient-seat gate, gage valves, and strainers in ¼ to 4-in. sizes. The publication presents tables of specifications and cutaway drawings showing valve interior details. Source: **Edward Valves, Inc., 1201 W. 145th St., East Chicago, Ind., U.S.A.**

Pipe in oil-field service

. . . is detailed in two self-contained volumes—72 and 74 pages—complete with comprehensive tables and vivid illustrations. Volume 1, devoted to basic general information, deals with the importance of pipe

Progress Report on Source Water Pumps for Secondary Recovery from

PEERLESS PUMPS

For Source Water. The Peerless Vertical Line shaft pump is adaptable to all type drives. In addition to the right angle gear drive pictured above, the pump may be ordered with a vertical hollow-shaft electric motor.

NOW GET UP TO 15,000 BPD FROM DEPTHS TO 1,500 FEET WITH PEERLESS VERTICAL LINE SHAFT PUMPS

Whether your source water is 150 feet or 1,500 feet deep, the Peerless vertical line shaft pump is the ideal pump for a steady dependable flood water supply. That's because it is big enough to do the job—up to 15,000 BPD from well depths to 1,500 feet; it is flexible enough to fit any water flood project; and it has been proved on the job over periods of up to five years of continuous flood water supply service.

Moreover, Peerless vertical line shaft pumps are specially built for the rigorous duty of handling corrosive fluids encountered in flooding operations. For example, the water lubricated type most frequently used for this service has special shaft bearings that are most resistant to the damages of abrasives and corrosives in the fluids being pumped.

And Peerless offers you a number of different models permitting the vertical line shaft pump to be tailored to your area and water flood conditions. An informative bulletin on these pumps is available to you upon request.

Write today and request your copy of Bulletin B-102.

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A valve is often looked upon as a "supply item" until it prevents a major process shutdown and profit loss...

Hancock Steel Valves provide the dependable protection demanded for every process application today and tomorrow. They are available in a wide range of operational pressures and temperatures . . . in an extensive selection of alternate trim, body, and bonnet materials to match the toughest services. They have that extra measure of quality that only a leader knows how to build into a valve...extra quality that extends the operating period between turnarounds and assures efficient, economical processing of petroleum and chemical products.

The valve illustrated at the left is the Hancock Type 950 Steel Gate Valve widely used by the processing and power industries.

For technical assistance in selecting quality Hancock Steel Valves, phone your industrial supply distributor or write for Catalog 200A.

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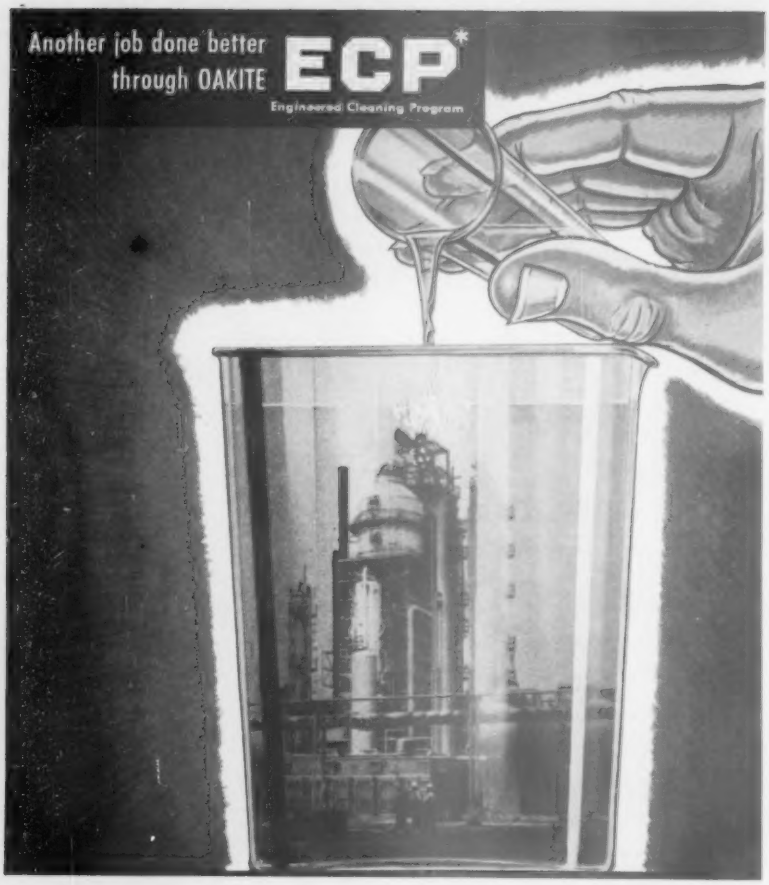

New Oakite Acalaid® "supercharges" solutions for toughest soil removal

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This proves the point that with Oakite ECP you profit from properly engineered *materials* and *methods*.

*Oakite ECP is a comprehensive cleaning program engineered to fit your particular operation under the experienced supervision of a local Oakite man. ECP covers every cleaning need. For details, write Oakite Products, Inc., 44C Rector St. New York 6, N. Y.

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SCIENCE

OAKITE ECP benefits you from the ground up . . .

at drilling site it speeds such salvage operations as paint stripping, rust removal, degreasing

it restores pipeline efficiency through chemical cleaning... it simplifies pump station housekeeping

in technological progress, marked by ever-increasing drilling depths which have presented many new difficulties. A special chapter covers various processes for making seamless and electrically welded steel pipe. Another chapter is concerned with the use of ordinary carbon steels and high-grade special steels. Volume 2—Useful Information for Oil-Field Experts—consists largely of clear, readable tables and charts of data on line pipe, tubing, and drill pipe for field use. Where tables alone are not sufficient, they are supplemented by formulas or diagrams. Shown are critical external pressures, resistance to internal pressure, joint strength for casing, buoyancy through fluid mud, biaxial stresses in the pipe, etc. Source: **Mannesmann AG, Dept. Verkaufswerbung, Thomasstrabe 6, Dusseldorf, Germany.**

Cork insulation

. . . for oil-storage tanks and other metal vessels is presented in a bulletin available free of charge. The product is a cold-applied, spray-on insulation composed of fillers of cork and asbestos processed with a bituminous base by means of petroleum solvents. Applied as a coating, it is said to provide heat insulation, condensation resistance, corrosion prevention, and protection against weather. The four-page bulletin includes information on use, composition, and method of application; thermal insulation values of coatings ranging from ⅛ to 1 in. in thickness; and instructions for calculating the amount of product required. Source: **Witco Chemical Co., Inc., 122 E. 42nd St., New York 17, N. Y., U.S.A.**

Handbook on oil-base muds

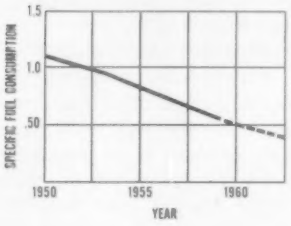
. . . deals with Black Magic mud and related subjects in 76 pages. Included are mixing formulas, treatment, test procedures, description of additives, and instructions for the care and handling of oil-base-drilling fluids and applications. In addition the pocket-size handbook contains sizes and capacities of casing and drill pipe, capacities of mud pits and tanks, volume and height filled for various diameters, and pump capacities. Source: **Oil Base, Inc., 130 Oris St., Compton, Calif., U.S.A.**

Small gas turbines soon to surpass piston engines for competitive applications

by Herbert Kunzel, President
Solar Aircraft Company
A Subsidiary of International Harvester Company

The gas turbine engine has made news this year as it has expanded into new and broader applications in the prime mover field. Behind this advance is continuing improvement in design and production. Even more advanced gas turbines will be developed in the next few years. In the small engine class (under 1000 hp) gas turbines will soon surpass overall piston engine performance and cost for competitive applications. They will also retain the inherent advantages of the gas turbine over the reciprocating engine.

One of the major reasons for this prediction is an impressive improvement in gas turbine economy. Previously, fuel consumption and high initial cost have kept the turbine out of all but selected power assignments. Industry and the military both thought the engines too expensive for most applications.



Through constant improvement, however, Solar has been steadily bringing simple cycle, small turbine specific fuel consumption down to an area competitive with piston engines. The fuel consumption of Solar's early 50 hp engines in 1948, for instance, was about 2.25 lb/hp-hr. The 1100 hp Saturn engine, which went into production this year, has the excellent simple-cycle fuel consumption of only .63 lb/hp-hr. Solar's experienced engineers improve life, "producibility," and performance characteristics with each new engine. At the same time, production costs are lowering rapidly.

Another significant advance in Solar turbine development has been the evolution of a unique design philosophy. Most gas turbines fall into one of two extreme categories: 1) Lightweight, high horsepower aircraft turbines, built to be as light as possible (about ¼ to ½ lb/hp), and 2) conventional industrial engines designed along the lines of steam turbines with a ratio of about 10 lb/hp. Both have inherent disadvantages. The aircraft turbines are relatively delicate with consequent problems of frequent overhaul and short life. Massive engine design, on the other hand, involves unnecessary bulk and difficulties with thermal lag and distortion. In either case, inherent advantages of the gas turbine engine are diminished and initial cost is adversely affected.

Solar's approach has been to develop a family of gas turbines that have both long life and light weight. The Saturn engine, with a weight-to-power ratio of 1.1 lb/hp, is heavier and more rugged than aircraft engines but much lighter than the usual industrial gas turbine. Although it is designed for long life, it has no more materials than are necessary to satisfy structural and thermal requirements.

Promising even further improvements in the turbine engine is the combination of Solar with International Harvester Company this year. IH saw the advantage of more power per pound several years ago. Their research and development has stressed performance and much work has been done by them on regenerative cycle turbines to reduce fuel consumption.

To basic research, they have added their many years of experience and leadership in high performance and low cost through efficient production of many thousands of IH engines for trucks, construction equipment and farm machinery.

Solar's successful Saturn engine development team and the combined research and resources of the two firms are now focused on further engine development in the area below 1100 hp. Preliminary design for a turbine in this range indicates that the following standards are feasible:

1. A life cycle equal to or better than conventional diesel engines—with considerably less maintenance.
2. Fuel consumption in the .4 to .5 lb/hp-hr range.
3. Cost competitive to conventional reciprocating engines.
4. Inherent ease of starting and operation in a wide variety of climatic conditions.
5. Small size and light weight.

Developments like these are certain to continue the increase in turbine applications and use.

For additional information write to Dept. H-212, Solar Aircraft Company, San Diego 12, California.

Saturn engine powering oil well fracturing unit

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▶ ▶ ▶ Equipment Men Notes

W. G. (Bill) Rudd joins Bovaird

W. G. Rudd

. . . as tubular sales manager, a newly created management position, announces W. J. Bovaird, vice president in charge of sales. Rudd has spent 24 years in the oil-field-supply field, starting with Lucey Products Corp. in 1937.

During succeeding years, he served as store manager, district sales manager in West Texas, assistant to the president, and, for the past 12 years, in a sales executive capacity. Rudd will headquarter at Bovaird Supply Co.'s general offices in Tulsa.

Jones & Laughlin Supply shifts

. . . two salesmen and appoints three store managers. L. K. Greer, salesman at Borger, Tex., has been transferred to San Antonio, and F. P. Crahan, Beaumont salesman, goes to Cameron, La.

C. L. Wallace, salesman at Brookhaven, Miss., and W. C. Blackledge, Natchez salesman, take over as store managers at their respective locations. New store manager at Carmi, Ill., is A. B. Colt. He held a similar post with J&L at Henderson, Ky.

R. F. Dauenhauer is manager

. . . of distributor sales for Hills-McCanna Co., according to Richard I. Allen, vice president of the Chicago firm. Dauenhauer will head up the sales of ball valves and diaphragm valves through industrial distributors in the U. S. and Canada. Prior to joining Hills-McCanna last October, he was western sales manager for Ohio Injector Co.

Continental-Emsco Co. promotes

. . . Rudd G. Seim and H. T. (Bud) Haugh. Seim, former district manager of the Tri-State area comprising Illinois, Indiana, and Kentucky, is now manager of the California division headquartered in Los Angeles. He joined C-E in 1948 in the credit division serving in various assignments, and has also served as an assistant district manager.

Haugh replaces Seim as Tri-State district manager. He was formerly in charge of sales for the Chicago office, and will now be stationed in Evansville, Ind. Haugh began his employment with Continental-Emsco as a trainee in 1951.

Minneapolis-Moline Co. sets up

. . . a separate division for construction equipment, to be known as Mopower Construction Equipment Division, with Bert F. Whitbread the sales manager. Mopower's products will include wheeled tractors, crawlers, and a variety of attachments for general-purpose highway and building construction.

Two sales-staff changes made

. . . according to W. R. (Bert) Wheeler, sales manager for American Iron & Machine Works, Inc., of Oklahoma City. Joe Thompson, a 13-year company veteran, has been appointed division manager with headquarters at Midland. The North and West Texas districts and the Dallas-Fort Worth area have been combined into this new division.

David Beachum, who formerly represented American Iron in Wichita Falls and Canada, has rejoined the firm as special representative in the Dallas-Fort Worth area.

Kenneth F. Williamson becomes

. . . vice president and product manager of valves at Grove Valve & Regulator Co., Oakland, Calif., a subsidiary of Walworth Co. Prior to his appointment, Williamson was assistant sales manager. He will remain in Grove's Oakland offices. Williamson, who has been with Grove 2 years, previously was sales coordinator for W-K-M Division of ACF Industries, Inc.

Franklin Supply shifts Don Hale

. . . from Casper, Wyo., where he was assistant store manager, to McCook, Neb., as store manager. Hale joined Franklin in 1956 as a storeman in the Ratliff City, Okla., store. Serving first as storeman in three company stores, he later became assistant store manager at Liberal, Oklahoma City, and Casper.

Other transfers involve Paul Harper, who worked 6 months in the company's main offices in Denver, now stationed in the Denver district as assistant store manager; and Ed Dawson, moved from New York to the Casper store as field salesman. Dawson joined Franklin in 1958 at Casper. He was later

---

Major portion of Vinson Supply stock is bought by firm members

. . . according to Bailie W. Vinson, chairman of the board and chief executive of the 35-year-old Tulsa supply company. As a result of the stock transaction, Vinson assumes the post of board chairman and chief executive officer only. He formerly held the titles of president and chairman of the board. Louis O. Barnett, former executive vice president, is now president and chief operations officer.

B. W. Vinson

L. O. Barnett

Barnett, a 21-year veteran with the company, was named vice president in 1957 after serving in various capacities, including vice president of the Tulsa Division. Other board members include John H. Heinzerling, vice president, Houston; B. E. Keeling, vice president, Odessa; Thomas B. Lowary, vice president, Tulsa; J. E. Edwards, secretary-treasurer, Tulsa; and John M. Winters, Jr., legal counsel, Tulsa.

Vinson established the oil-field-specialties supply firm in Tulsa 35-years-ago to furnish supplies and equipment to refineries. The company's services now are extended to include petrochemical and other processing industries and drilling-producing phases of the industry, as well as refineries.

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transferred to Farmington and then to Tulsa as assistant manager of purchases. In 1959 he was moved to New York as manager of purchases, the post he held until his transfer back to Casper.

Pierce, Mordy elected to board . . . of directors of Smith Industries International, Inc. Cameron G. Pierce is president of Long Electronics Division of Long-Temco Electronics, Inc. He has more than 20 years of electronics experience,

C. G. Pierce

George Mordy

including research and development as well as top-level management activities. George Mordy is president of Spring Street Capital, Inc. He is also president of George Mordy & Co., specializing in corporate management functions.

John W. Hammond is promoted . . . from industrial promotions to manager of the seven-state northwest region of Appleton Electric Co., succeeding Eric A. Hakanson who retired. Hammond joined Appleton in 1953 as a field engineer in Los Angeles. He later served in Baltimore, Cincinnati, and the Chicago office, where he was stationed since July 1959.

B. J. Michael is store manager . . . at Casper, Wyo., for Republic Supply Co., reports C. J. Jump, general sales manager. Michael has been with Republic since early 1957. He was a field sales representative in Healdton, Okla. and in Casper before being promoted to store manager.

John C. Stick, Jr. joins . . . Perkin-Elmer Corp. as special assistant to the general manager of the Norwalk, Conn. firm's Instrument Division. He will be responsible for coordinating the joint efforts of P-E and its affiliate company, Atomium, Inc., Waltham, Mass., in the field of low-level nu-

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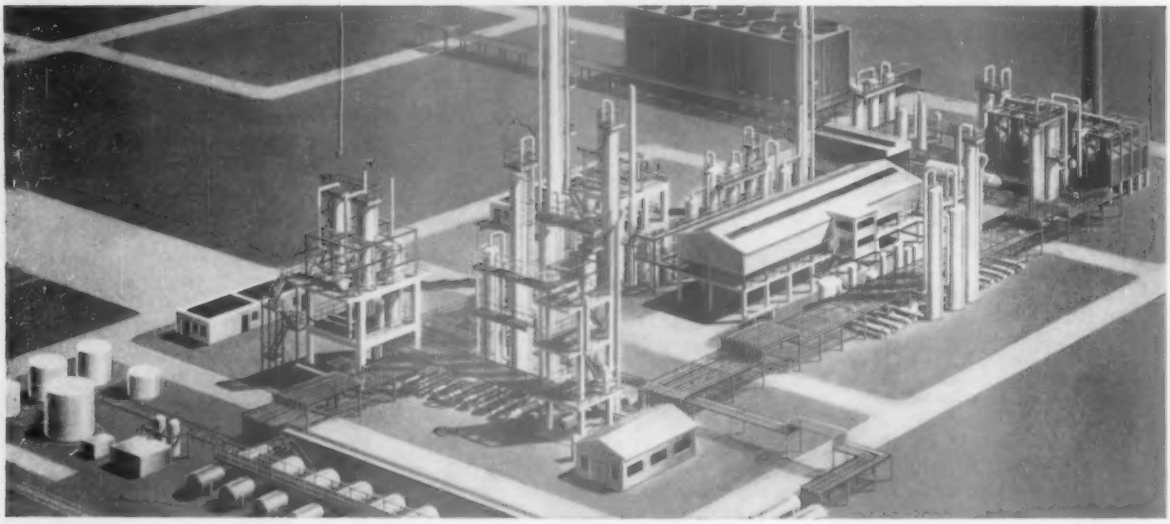
New $20 million Ethylene and Ethylene Oxide plant to go on stream for SunOlin in 1961

FACILITIES WILL PRODUCE 225,000,000 LBS. OF ETHYLENE AND 55,000,000 LBS. OF ETHYLENE OXIDE PER YEAR



The Lummus Company has been awarded the contract to design, engineer and construct a $20 million ethylene and ethylene oxide plant for SunOlin Chemical Company at Claymont, Delaware.

The plant is scheduled to go on stream late in 1961, and will have a design capacity of 225,000,000 lbs. of ethylene and 55,000,000 lbs. of ethylene oxide per year. Existing facilities will be modified to permit production of 12,000,000 cubic feet of high-purity hydrogen and up to 1,000,000 cubic feet of carbon monoxide per day.

The new units will be located at Claymont, Delaware, adjacent to the Sun Oil Company's Marcus Hook Refinery which will supply the raw material for the plant.

A substantial portion of the products produced will be used to supply the requirements of major chemical companies in the area. To permit efficient delivery of ethylene and other petrochemicals, a multiple pipe line crossing will be laid under the Delaware River from the site to serve customers in the expanding Southern New Jersey industrial area.

The remainder of the production will be used in the manufacture of products marketed through existing sales outlets of Sun Oil Company and Olin Mathieson Chemical Corporation, the joint owners of SunOlin.

The plant will employ Lummus' low-temperature ethylene separation process, which provides high separation efficiencies and unusual flexibility and reliability; and Shell Development Company's ethylene oxide process, which offers the advantages of unusually high yields and virtual elimination of waste disposal problems encountered in the classic Chlorohydrin Process.

SunOlin is the fourteenth ethylene, and the fifth Shell Process ethylene oxide plant to be designed, engineered, and constructed throughout the world by Lummus.

Lummus has over 50 years' experience in the design and construction of more than 850 plants for the world-wide process industries. Call Lummus on your next project.

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clear instrumentation. Before joining Perkin-Elmer, Stick was with Lane-Wells Co., Houston, as chief log analyst. Earlier he was technical director of Well Surveys, Inc., Tulsa.

Southern Pipe names two veeps ... in the persons of Charles E. Lamar and Gordon C. Graham, both of Glendora, Calif., according to D. A. Stromsoe, president of the division of U. S. Industries, Inc. Lamar, who joined Southern Pipe as a sales engineer in 1951, was promoted from sales manager to vice president of marketing. Graham, formerly plant manager, is now vice president of manufacturing. He came to Southern Pipe from North American Aviation in 1953.

Karl E. Johnson named manager ... of the Gas Division and elected a vice president of J. F. Pritchard & Co., design, engineering, and construction firm of Kansas City. Johnson joined Pritchard in 1946 and became manager of the Tulsa district office. Later the same year he was chosen to open and manage the Chicago district office.

In 1952 he returned to Kansas City as manager of the Equipment Division. Subsequently, he was elected vice president and general manager of the newly formed J. F. Pritchard & Co. of California, the manufacturing subsidiary of the parent company. Johnson headed this organization until the present.

Lansing M. Hinrichs promoted ... to general manager of Girdler Catalysts, a unit of the Louisville-headquartered Chemical Products Division of Chemetron Corp. Hinrichs, who joined the company in 1951, was patent counsel for Girdler Process Equipment Division in Louisville before becoming assistant to Chemical Products Division President Howard D. Hartough in 1959. He has been assistant general manager of the catalyst operation for the past year.

Dr. Hugh B. Ogburn is named ... manager of the process-engineering department by M. W. Kellogg Co., New York engineering and construction organization. In this capacity he will be responsible for the economic and technical evaluation and development of process designs for petrochemical plants and oil refineries.

REPRESENTATIVES from Skelly Oil Co., Axelson-Garrett, and Jones & Laughlin Supply Division inspect one of the longest strings of sucker rods ever successfully installed in a well in the Mid-Continent area. The sucker rods, totaling 13,800 ft. or 2.6 miles in length, were run in a Grady County, Oklahoma well for Skelly Oil, of Tulsa. The tapered Axelson sucker-rod string included 2,800 ft. of 1-in., 3,000 ft. of ⅞-in., and 8,000 ft. of ¾-in. rods. The sucker rods were purchased from J&L Supply Division at Oklahoma City.

Practical ideas to help you Stop CORROSION

DETERMINING CURRENT REQUIREMENTS TO STOP CORROSION OF OIL WELL CASING

Would an experienced corrosion engineer make these mistakes in running current requirement tests for protection of a bare pipe line:

(1) **Use an electrically isolated lateral line as the ground bed?** The answer is, of course, "No." Current distribution along the line—the single most important factor in cathodic protection—is a function of the distance of the ground bed from the pipe line.

The same principle applies to the casing in oil and gas wells, because the casing is simply a vertical pipe line. The current required for external protection cannot be resolved by the Log Current-Potential method if the flow line—insulated off or disconnected at the well head—is used as the ground bed. This fallacy has been demonstrated many times by measuring the current pick-up along the casing with the down-the-hole potential-drop test.

If factual data is to be obtained, a temporary ground bed positioned the same distance out from the well as the permanent ground bed must be used.

(2) **Measure pipe-to-soil potentials with the reference half-cell located on the opposite side of other pipe lines?** Again, the answer is "No." Also, in running Log Current-Potential curves on wells, it is important that the half-cell have an unobstructed view of the well under test.

Your best assurance of obtaining factual information from current requirement surveys on wells is to call CSI engineers. They developed the surface instruments and techniques used to run Log Current-Potential curves which correlate best with down-the-hole potential-drop tests. They have almost a quarter of a century's experience in successful cathodic protection.

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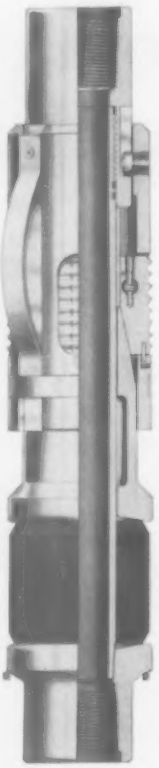
IN THIS POSITION, the full-opening R-3 Packer is an excellent *tension-set*, self-anchoring wall packer. It is designed to seal against differential pressures up to 5,000 psi from below. In this application, right-hand rotation and upward pull on the tubing sets the slips and expands the packer rubber to provide a seal.

TURN IT OVER . . . . . ▶ and the R-3 becomes a *compression-set* packer, ideal for use in deeper wells where tubing weight is sufficient to set packer rubbers. The R-3 is usually run in this position for holding pressure from above where hydrostatic pressure in the annulus exceeds pressure below the packer.



RANGE OF SIZES includes models for use inside 2⅞" O.D. tubing through 7" O.D. casing. Efficient design makes R-3 redressing and replacement of parts a simple operation.

The R-3 Treating Packer is immediately available through your Halliburton Representative. Try an R-3 and see for yourself how versatile a packer can be!

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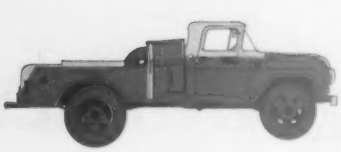

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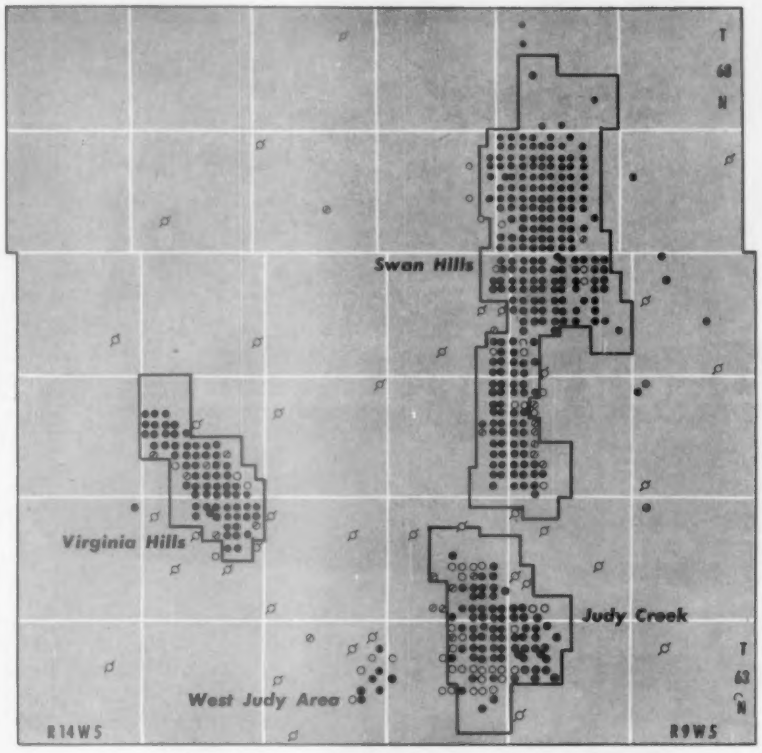

THESE four sectors make up Swan Hills area.

DATA ON NEW FIELDS:

Swan Hills area

1. Approved field name: Swan Hills area. Location: West Central Alberta province. Individual fields: Swan Hills, Virginia Hills, Judy Creek, and West Judy Creek.

2. Discovery dates: Virginia Hills, January 1957; Swan Hills, November 1957; Judy Creek, February 1959; West Judy Creek, October 1959.

3. Trend of development: Two trends, north-south and northwest-southeast.

4. Number of producing wells: 396 (Swan Hills 244; Judy Creek 73; Virginia Hills 72; West Judy Creek 7).

5. Spacing pattern: 160 acres.

6. Proved acreage: Estimated 122,000 (Swan Hills 68,500; Judy Creek 28,000; Virginia Hills 21,500; West Judy Creek 4,000).

7. Principal operators: Imperial Oil Ltd.; Pan American; British American; Hudson's Bay; Home Oil; Shell Oil.

8. Present allowable: (MPR) Swan Hills 180; Virginia Hills 150; Judy Creek 130, and West Judy Creek 140 (all bbl. per day).

Drilling Operations

9. Number of active drilling rigs: 34 with 32 development and 2 wildcat.

10. Casing program: 8⅝-in. surface casing set at 600 ft. with 425 sacks cement. 4½-in. oil string set to TD with 1,000 sacks posmix.

11. Average drilling time per well: 26-34 days.

12. Types of drilling fluid: Water-gel emulsion with less than 5% by volume oil. Shale-resistant mud.

13. Completion methods: Perforate casing; small acid squeeze through perforations; acidizing.

14. Types and sizes of bits: Total of 25 rock bits of various sizes.

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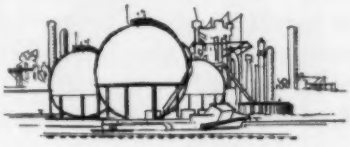

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YIELD DATA

Product—	%	Vapor temp., °F.		Gravity
Gasoline	11.70	212	at 700 MM	73.0
Total gasoline and naphtha	36.90	392		58.4
Kerosine	9.70	482		42.3
Gas oil	16.75	420		36.6
Lube distillate	16.16	565	at 40 MM	28.0
Residue	17.90			16.8
Loss	2.60			

(Paraffin-base crude)

NOTE: The Carson Creek North oil pool and Carson Creek gas pools (both in the Swan Hills member) are located only 10 miles south of the West Judy Creek field.

Tricone bits; 15 in. for surface casing, and 8¾ in. for production casing.

15. Special drilling problems: Differential sticking in carbonate section. Occasional difficulty with stuck pipe due to excessive filter cake over a limy anhydrite stringer at 7,500 ft.

Geology

16. Producing formations (and depths): Devonian-Swan Hills member of Beaverhill Lake group, 7,845 to 9,282 ft.

17. Reservoir characteristics: Gas solution drive. Gas-oil ratio: Low, 500 to 1; high, 800 to 1. Oil-water contact: VH-5,660 ft. Gas-water contact: None.

18. Geologic markers: Second Specks, 3,200 ft.; Blairmore, 4,000 ft.; Wabamum, 5,600 ft.; top Beaverhill Lake, 7,900 ft.; Swan Hills member, 8,050 ft.

19. Type trap: Stratigraphic: bioherm reef.

20. Core data: Porosity: 6-10%; permeability, 120 md.; residual oil saturation, 80%; total water saturation, 15%. Cored interval: Swan Hills member, top of pay to oil-water contact in selected wells. Net feet of pay: 57-160; average 78 ft.

21. Estimated recovery: 20%; 75 bbl. per acre-ft. recoverable. Average estimated recoverable: 1,100,000 bbl. per well.

22. Pressures: Virginia Hills, 3,650 psi. at 5,615 ft. March 1960; Judy Creek, 3,340 psi. at 5,230 ft., August 1960; Swan Hills, 3,160 psi. at 4,800 ft., November 1959.

23. Tests and logging procedures: Induction electric log from surface casing to TD. Gamma ray-sonic or MicroLog through pay. Radioactivity log after pipe is set.

24. Pipeline outlets: Federated Pipeline System.

25. Exploration methods before discovery: Seismic; subsurface geology.

26. Average costs: Dry hole, $100,000; flowing well, $130,000-$165,000; pumping well, $145,000-$185,000; average total depth, 8,400-9,400 ft.; footage rate, $5.50; day rate, $1,050 with pipe; average lease price: $720-$2,000 per acre (proved average).

27. Crude analysis: Gravity °API, 39.4-41.0; sulfur, 0.19%; viscosity at 70° F., S.s.U., 47; viscosity at 100° F., S.s.U., 39; pour point, −25; b.s. and w., 0.2%; salt, 242 lb. per 1,000 bbl.

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Looking deeper, recently developed refraction interpretation techniques, special refraction instruments and seismometers are giving GSI clients subsurface data in areas where it was unobtainable in the past.

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What do rockhounds like to read?

We'd like to know, so we're making a survey to find out. You'll be hearing from us.

BY FRANK J. GARDNER

LIKE ANY other professional man, the explorationist must keep abreast of new developments and discoveries in his field. And the best approach to that problem lies, of course, in reading and study.

If he read everything that's published in his field, however, the oil finder would have time for little else. He knows what he wants, and he's selective. He may be a first-contact reader, a delayed reader, or a chronic clipper-filer. His interests may encompass the world, or they may be confined to Yell County, Arkansas. He may range only in proved territory, or he may be strictly a frontier type.

Every 5 years or so, the Journal surveys its exploration readers via the mail. We want to know where their interests lie, if we're serving them adequately, and what we can do to serve them better. Have their spheres of operation shifted? Where, when, and what do they read?

When we receive the answers, we don't just "file 'em and forget 'em". We act on them. The last such survey caused some major changes. It revealed that a growing awareness of foreign activity demanded increased foreign exploration coverage; that 75% of the oil finders follow nationwide trends, while only 25% confine their interests to local areas. It disclosed an almost-universal preference for regional articles as opposed to limited-area ones. It found an unsuspected open mindedness toward new or controversial methods of exploration, provided they are labeled as such. And it showed that most oil finders are chronic clippers and filers.

Now, we're on the verge of a new survey. You'll be hearing from us. And your answers to our inquiries will exert a powerful influence on what you'll be reading over the next 5 years. There'll be questions about your reading habits, your preferences, and your needs.

One question, that appeared in the last survey, however, will not appear this time. It read: "Should the Journal devote more space to the uranium search?"

How times change!

Lithofacies maps
—take Idaho, for instance

Here's a valuable and inexpensive tool for your exploration kit

BY PETER B. BIKE
Geophysical Editor

MUCH OF IDAHO has basement rock surface exposures. In this map showing the geologic provinces and tests drilled in the state, it is apparent that the southeast portion of the state is the most promising for finding oil and gas. Yet this vast area is virtually untested.

THE GEM STATE hasn't made the petroleum news lately. The last noteworthy information concerning Idaho was the announcement that its legislature was proposing a bill to pay a $50,000 bonus to the first operator who brings in a 50-bbl. well that produces for 60 days.

It hasn't always been this quiet in the state. Remember 1955 when the big hunt was on for gas in the southwestern part of Idaho? The flurry subsided and no great reserves were found. This activity took place in the Vale-Ontario basin northwest of Boise. In fact, 1955 was one of the most active in state history.

Drilling history. According to state records, there have been only 67 wells drilled in Idaho since the first test went to a depth of 660 ft. in 1903. The operator for this Teton County well was Fremont Oil & Gas Co. No other data are available except that the surface formation was believed to be the Cretaceous-Frontier sandstone.

Two deep tests were drilled by Phillips Petroleum Co. which went below 12,000 in southeastern Idaho. Phillips and Utah Southern Oil Co.

may help pinpoint oil areas

completed an Oneida County test in 10-14s-30e which went to 12,844 before abandonment. This hole was finaled in February 1951 in the Mississippian-Brazer formation.

Another deep effort completed in March 1953 was the Phillips 1 Horseshoe in 28-5n-44e, Teton County. This test bottomed in undifferentiated Mississippian beds at 12,720 ft. The well was plugged and abandoned.

Two things are brought to mind in a review of Idaho drilling activity. The search for oil and gas has been long and fairly continuous. A big play occurred in 1955 with most of the activity concentrated in the western part of the state in the Vale-Ontario basin. Nine wells were drilled in 1955 and four in 1956. Small amounts of gas have been found but none were long lived. Since 1956, comparatively few wells have been attempted, and last year only one wildcat was drilled—a test in Owynee County in the southwest part of the state. All indications point to gas possibilities. Good shows have been found. What's more, it's a commonly accepted fact that gas, especially helium, and extreme metamorphism go hand in hand. With this in mind, it's a safe bet that some day Idaho will prove to be a good helium reserve.

Bear in mind that the state has had but 67 tests in the last 47 years. The average depth of these holes was only 2,594 ft. For all practical purposes, Idaho has hardly been tested, when one considers the very low well density and the possibility of a sedimentary section of 20,000 to 30,000 ft. in the southeast quarter.

This likeliest of areas in the state, the southeast quadrant, is comprised of over 28,000 sq. miles; yet there have been only 23 tests. This is a well density of one probe for every 1,217 sq. miles. Only six tests in the entire state have penetrated depths below 5,000 ft. Think of the tremendous untested section that remains!

How would you evaluate the entire state as an oil and gas-bearing province? Chances are that you wouldn't spend too much time thinking about it because of the obvious thousands of square miles covered by basement complex. There are three prospective areas to study. Granted, these involve many surface miles, but over half of the state—the north half—is immediately discounted because of batholitic outcrops.

Geologic provinces. The southern half of the state is considered the most prospective for seeking petroleum reserves. This area includes: the Vale-Ontario basin in the west, the Snake River downwarp in the south, and the Great basin in the southeast. Although there are other sedimentary provinces in Idaho, they are small in area and hold little promise. They don't appear to have a very thick section nor is enough known about them to make a logical evaluation.

A new tool. One of the finest sources of stratigraphic data ever combined in one easy-to-read volume has come to our attention. It's a monumental work called Lithofacies Maps, An Atlas of the United States and Southern Canada, by L. L. Sloss, E. C. Dapples, and W. C. Krumbein, professors of geology at Northwestern University. The atlas is published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. What's more, this handy tool came off the press in 1960 and sells for only $5.50.

How it works. Take Idaho, for example. What are the most likely areas? Although there are 153 lithofacies maps in the atlas covering much of the U. S. and parts of Canada, let's look at only those concerning Idaho. One notes that Cambrian through Miocene sediments are represented. Not only are we able to see the distribution and thickness, but the graphic symbols describe the lithology according to a triangular scale which relates the clastics and nonclastics and gives the sand-shale ratios.

It is readily apparent that anyone interested in Idaho should confine his primary efforts to the southeast portion of the state. This means that portion east of an extension of Utah's west line north through Idaho until it intersects with the Montana boundary. In this quadrant are two likely geologic provinces: the Snake River downwarp and the Great basin. The latter is comparable to part of Utah's producing area. Little is known about the relationship of structure and stratigraphy in the Snake River area because of paucity of tests. Using the atlas, it is possible to estimate the entire section present and the likely lithology to be encountered. Where then are the best areas?

In this volume is a series of maps covering the respective systems in Idaho from the Cambrian through the Cretaceous. Some are broken down into more detailed subdivisions of these systems. With a large-scale base map showing the counties, it is possible to study the lithofacies maps and relate the more prospective areas to the county base map for pinpointing geographic positions.

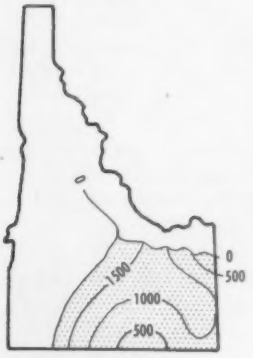
The starting point in evaluating the stratigraphy of the systems, would be to have maps of each system all on the same scale. A critical consideration of the stratigraphic study is the relationship of underlying older beds to the younger beds immediately overlying them. It simply amounts to a layer-cake comparison so that if a suitable reservoir is likely, does this area have a desirable cap rock? The reader notes in this preliminary study that primary consideration is purely stratigraphic—do reservoir and cap rock exist? Relationship of structural conditions which will provide

a suitable trap is a later evaluation. In short, this stratigraphic study is a culling process. Now, let's check the maps.

Key to the type of facies is as follows:

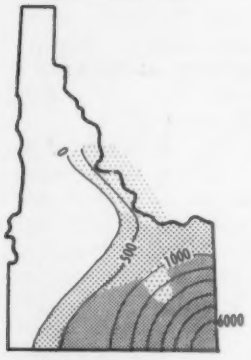
Sand Shale Limestone

Starting with the oldest sedimentary section present, there are three Cambrian maps. The first is the entire system while the other two break it down into Lower Cambrian while Upper and Middle Cambrian are combined. Looking at only the two subdivisions of Cambrian, it is seen:



L Cambrian

Thickness of section varies from 0 to 1,600 ft. Average thickness is estimated as 800 ft. The lithology is mostly sand with a sand-shale ratio greater than 8 to 1. This appears to be a good target where local structural conditions will provide a trap. Reservoir potential is good if the overlying beds are impervious.

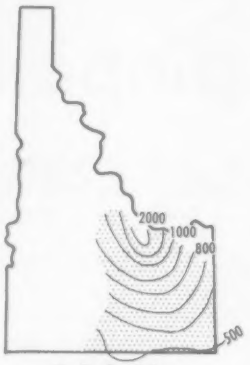


M & U Cambrian

Thickness of the section varies from 0 to 6,000 ft. The thickest section is in the extreme southeast corner of the state in Bear Lake County. Average thickness is estimated at 1,500 ft. The lithology is sandy shale, shale, and carbonates. The wedge of shale trending northeast may provide a cap for the underlying sandstone in the Lower Cambrian from Twin Falls County to Jefferson County to the northeast. The carbonates may provide a suitable reservoir if porosity and permeability exist. Note the two sandy shale areas where the sand may be well developed. The first is seen near the common boundary of northwest Bingham and western Bonneville counties. The other is to the north in northwest Clark County

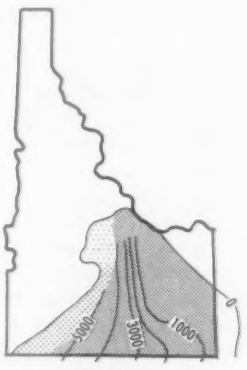
Ordovician

The Ordovician section varies in thickness from 0 to 9,000 ft. in Custer County. It thins to the northeast and the west. Average thickness is estimated as 2,500 ft. Note the thick shale section in the Ordovician which overlies the M. and U. Cambrian sand in Lemhi County, where no tests have ever been drilled. The Lemhi River Valley is mostly sedimentary section. An arcate pattern of sandy shale is seen between the carbonates and the shale extending from southern Twin Falls County to Lemhi County. The M. and U. Cambrian sand facies are overlain by Ordovician carbonates.



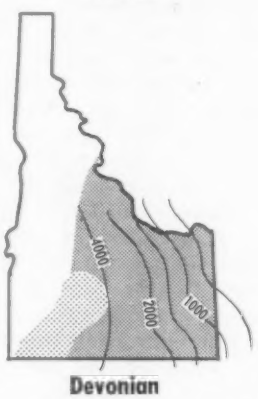
U. Ordovician
(St. Peter-Simpson Equivalent)

The Upper Ordovician in Idaho (St. Peter-Simpson equivalent) varies in thickness from 0 to 2,000 ft. Generally it thickens to the north. Average thickness is about 800 ft. Comprised of mostly sandstones, this section appears an excellent target, depending upon the overlying formations.



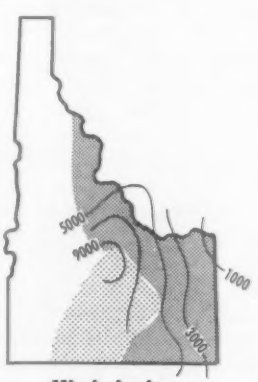
Silurian

Thickness of the Silurian varies from 0 to 5,000 ft. with an average thickness of 2,000 ft. Shales, limes, and some sands are present. The Silurian carbonates may make a good seal for the Upper Ordovician where traps exist. An area of sand is noted in western Custer County.



Devonian

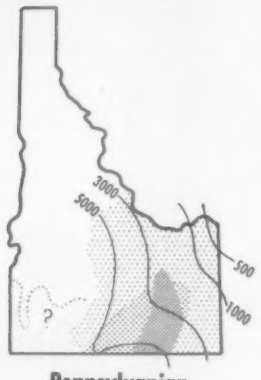
The Devonian varies from 0 to 4,000 ft. in thickness with an average of about 2,500 ft. Generally, the Devonian beds thicken to the west. This section may provide adequate suitable cover to the Upper Ordovician to the northeast where the Silurian is absent. It is well to remember that the Devonian carbonates are excellent reservoirs in much of the Rocky Mountain region and it is possible that similar development may occur in Idaho.



Mississippian

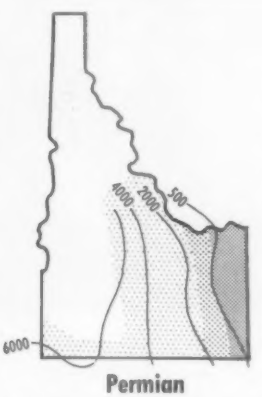
The Mississippian, where present, is from 1,000 to 9,000-ft. thick. Average is about 5,000 ft. Except for the south and south-central parts of the state, these are mostly carbonate rocks. In the former area, the section is comprised of shales. Mississippian shales overlie Devonian limestones in eastern Custer County. This is a sector that hasn't been tested for 100 miles in any direction. It is sur-

prising, too, because an adequate sedimentary section appears present.



Pennsylvanian

Where the Pennsylvanian is present, it is from 500 to more than 5,000-ft. thick. Average thickness is of the magnitude of 3,000 ft. This system is represented mostly by sandstones with some shales and limestones. Of particular interest is an area in eastern Lemhi and western Clark counties where the sand-shale ratio is greater than 8 to 1. Another sector of note is the southeast corner of Bear Lake County. Here, Standard of California 1 Sheep Creek, 34-15s-45e, drilled to 6,768 ft., bottoming in the Upper Pennsylvanian-Wells formation (equivalent to Tensleep-Weber of western Wyoming) in 1952. A well in the northwest corner of this county, Eastern Idaho Development Co. 1 State in 21-10s-43e, encountered minor shows of gas at 3,000 to 3,400 ft. in a 3,900-ft test, abandoned in August 1956.

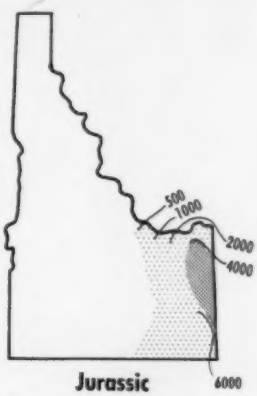


Permian

Where the Permian is present, its thickness ranges from less than 500 to more than 6,000-ft. thick. Average representative Permian beds are estimated at 3,000 ft. Of particular interest is the extreme southwest corner of Owyhee County where the sand-shale ratio is greater than 8 to 1. Little is known about the subsurface geology in this area because there have been no tests and this is a region that has been little investigated. In reservoir characteristics, much of the east half of Custer County is believed to have a Permian sand section of 2,000 to 6,000-ft. thick. Another point of interest is the shale facies of the Permian that overlies potential Pennsylvanian sands.

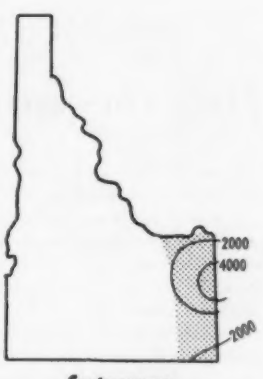
Triassic

Triassic sediments range in thickness from 0 to 5,000 ft. Average section is approximately 2,500 ft. Generally, these beds thin to the west. A wedge of carbonates trending north-south is flanked on the east and west by a shale section. A likely place for underlying Permian production may exist where the shale forms a seal over the Permian sands along a line from the south border of Twin Falls County to a point approximately at the northwest corner of Butte County. Two possibilities are apparent—entrapment could exist along the north flank of the Snake River downwarp in northern Lincoln County, or on the south flank in Jerome County. Neither county has been tested. Another potential area is entrapment of Pennsylvanian sands and Permian limestones by the western wedge of Triassic shales along the eastern edge of Idaho. Lothologically, best chances for petroleum accumulation may occur in the Overthrow belt from southeastern Bear Lake County to east-central Bonneville County along the Idaho-Wyoming state line. In addition to the three tests in Bear County, there have been two in Caribou County and one in southeast Bonneville County (see big map). The Bonneville test was the Sun-Sinclair 1 Big Elk Mountain which went to 5,597 ft. and unofficially had a flow of 5 M.M.c.f. of nonflammable gas. Bottom-hole formation was the Upper Cretaceous-Wells. Test was abandoned as dry in October 1950. Only the Standard of California test (the westernmost of the two Caribou County wells) reached the Mississippian It finaled in the Madison at 7,868 ft.



Jurassic

The entire Jurassic section is from 500 to 6,000-ft. thick where it is present in Southeast Idaho. The estimated average thickness is strictly a local proposition. In the Lower Jurassic alone, there is from 1,300 to 2,000 ft. of sandstones with a sand-shale ratio greater than 8 to 1. A likely area may exist in northwest Power County. Two tests in this county went to 1,550 and 3,855 ft. No information is available on either test.



Cretaceous

Estimates of the total section of Cretaceous sediments vary according to the particular study. For the purpose of conservatism, it is noted that the entire stratigraphic sequence is limited mostly to the eastern edge of Idaho. Some stratigraphers feel that as much as 7,000 to 14,000 ft. may be present while others indicate that 2,000 to 4,000 ft. is more truly representative. One thing, is certain—control is sparse. It is advisable to make further sand-shale studies because this system has a great potential. Another consideration is the entrapment potential of Cretaceous rocks over the underlying Jurassic sands. The accompanying map shows the Cretaceous as predominantly shale. It is more likely that sands and shales alternate.

The preceding is offered as an approach to an evaluation of Idaho. The state is intriguing from an exploration standpoint and when one considers how

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You never see a mud pump jetting mud on this giant drilling barge.

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little testing has been done in the past 47 years, the region certainly merits further investigation. The writer feels that the state will one day come into its own and join the ranks of producing states. Or perhaps you have another area you'd like to check. Try this tool for yourself.

The atlas is the result of over 10 years work on the part of the authors and graduate students of Northwestern University. These men have done a remarkable job. For the reader's information, the proceeds from the book go to the geology department of the university. Meanwhile, watch for the boom that is bound to come in Idaho.

Acknowledgments

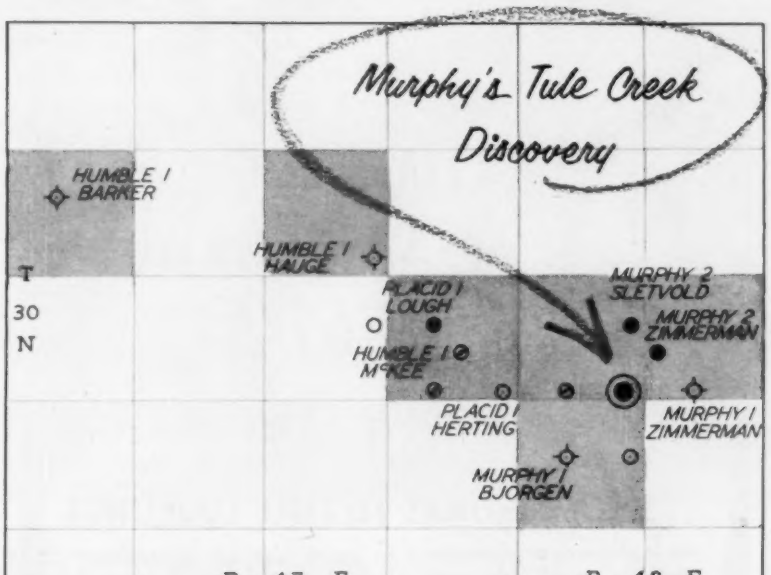
Appreciation is expressed to the men of the Idaho Bureau of Mines and Geology, Moscow, Idaho: E. F. Cook, director; L. S. Prater, assistant director; and David W. Young, administrative assistant, for generously providing the well data and drilling statistics. Thanks also are due the men of Northwestern University, professors and graduate students, who have contributed their efforts in making the atlas available to the petroleum industry.

Montana discovery well, offset completed

Completion reported at Tule Creek, Montana well

Completion is reported at Placid Oil Co. 1 Lough in C SE NW 13-30n-47e, Roosevelt County, Montana.

The well flowed 500 bbl. per day from Nisku Devonian perforations at 7,624-46 ft. Also reported is a temporary abandonment at 2 Lough, C SE SW 13-30n-47e. Casing was set and the Nisku perforated, but recovery was not commercial. These two wells are located 1½ miles northwest of Murphy Corp.'s 1 Sletvold, field discovery well in C SE SE 18-30n-48e. A north offset, completed by Murphy, made 145 bbl. of oil and 356 bbl. of water per day from perforations at 7,684-88 ft.



Here's the score at Tule Creek: four producers, three drilling and five dry.

Tule Creek offset flows high hourly rate

A good hourly flow of 28 bbl. is reported on a drill-stem test in Nisku Devonian at Murphy Corp. 2 Zimmerman, northeast offset to the field discovery well at Tule Creek, Roosevelt County, Montana.

The test was at 7,670-7,705 ft. Coring is now below 7,705 ft. The discovery well at Tule Creek flowed 476 bbl. of oil per day when completed last year. Flow was from Nizku at 7,660-92 ft. Murphy abandoned 1 Zimmerman in C SE SW 17-30n-48e, at 7,777 ft., southeast of the field opener. Placid Oil Co. is running logs at 7,748 ft. at 1 Herting in C SE SW 18-30n-48e, west of the discovery well. Northwest, Humble and Phillips are running drill-stem test in the Nisku at 1 McKee in C NW SE 13-30n-47e.

Oklahoma drilling news ranges all over the state

EXPLORATION and development work is running strong in Oklahoma this month. Important events are reported from all sectors of the state.

Enville. Sinclair Oil & Gas Co. 2 Stevens is testing in SW NE SE 32-6s-3e, West Enville field, Love County. The well flowed 243 bbl. of condensate and 3,719 M.c.f.d. during test of the Oil Creek Ordovician at 10,270-80 ft. This well is in the Marietta basin.

Wichita uplift. El Paso Natural Gas Co. is completing two wells in the South Erick gas area of Beckham County in western Oklahoma.

The 1 Miller, C SE SE 23-8n-25w, topped the Brown dolomite Permian at 1,908 ft. Flow was 1,600 M.c.f.d. The 1-A Wallace in C SE SE 18-8n-26w, flowed 1,125 M.c.f.d. from perforations at 1,938-45 ft.

McClain County. Tennessee Gas Transmission Co. dually completed 1 Newcomb in C SW NW 33-6n-3w, East Criner field. Oil flowed from both Hunton and second Bromide sands.

The Hunton at 8,810-16 ft. was good for 90 bbl. of oil per day through 10/64-in. choke. Flow was 172 bbl. per day through 10/64-in. choke from the Bromide at 9,742-50 ft.

Kingfisher County. Operations continue briskly in this Central Oklahoma boom area. Oklahoma

Natural Gas Co. 1 Shimanek, C SW NE 9-19n-6w, East Hennessey field, flowed 315½ bbl. of oil in 6 hours through 24/64-in. choke from Manning Mississippian perforations at 6,560-6,660 ft. Meramec Mississippian open hole at 6,786-6,898 ft. gave 266 bbl. of oil in 5½ hours through 24/64-in. choke.

Humble 1 Scheulen, C SW SW 3-18n-7w, flowed 22 bbl. of oil in 11 hours from Manning at 6,990-7,032 ft., extending the north side of North Dover field. The 1 DeWeese, C SW SW 10-18n-7w, flowed 122 bbl. of oil in 6 hours through 24/64-in. choke from Manning perforations at 7,009-60 ft.

Dewey County. Union Oil Co. of California 1-4 Lisle, C NE SW 4-16n-17w, Putnam field, western Oklahoma, flowed 3,200 M.c.f.d. during tests of the Oswego lime at 9,446-66 ft.

Sinclair extended West Valley Center field 1 mile east at 1 Kunc, C NE SW 12-17n-18w. The well flowed 7,304 M.c.f.d. from perforations at 9,150-90 ft. in the Oswego lime through ¾-in. choke. Final test was 5,208 M.c.f.d. through ½-in. choke with 96 bbl. condensate in 12 hours.

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No Lubrication
No Wearing Parts
No Maintenance
HIGH SPEED HEAVY DUTY
FLOATING SHAFT COUPLING
FLYWHEEL ADAPTOR TYPE
MEDIUM AND LOW SPEED HEAVY DUTY
THOMAS FLEXIBLE COUPLINGS
Write for Our New Engineering Catalog 60
THOMAS FLEXIBLE COUPLING COMPANY
WARREN, PENNSYLVANIA, U.S.A.

West Texas' Dawson County gains new Spraberry well

A flowing Spraberry discovery is reported in southwestern Dawson County, 6 miles southwest of Lamesa, Tex. The well is Pan American Petroleum Corp. 1 Lindsey Operating area.

This new pool opener flowed 116 bbl. of 39.8°-gravity oil plus 6 bbl. load water in 24 hours on potential test. Production is from perforations at 8,190-8,202 ft. Location is in Section 32, Block 36, T-5-N, T&P Survey, 5 miles southeast of Hoske-Pennsylvanian field.

Reeves County. Tom Brown Drilling Co. et al. completed a flowing Delaware sand discovery in southern Reeves County, 20 miles southeast of Pecos.

The well flowed 169 bbl. of oil plus 35% water per day on test through 20/64-in. choke. The 1 J. B. Young et al. is producing from perforations at 5,161-70 ft. Location is in Section 6, Block 50, T-8, T&P Survey, 10 miles southwest of Worsham field.

Texas' Brown-Bassett stretches southeast

In Texas, Mobil Oil Co. 1 Banner State gas well, recently completed for a calculated open flow of 165 M.M.c.f.d., represents a 2-mile extension of big Brown-Bassett field.

The open flow is the greatest encountered in Brown-Bassett field, where Mobil has now completed seven wells. Two others are being drilled. Gas from the field began moving to western markets via pipeline in December.

The 1 Banner State, located in Terrell County, 29 miles northeast of Dryden, Tex., was completed in the Ellenburger through perforations at 13,370-13,423 ft. and open hole between 14,423-14,529 ft. The company said work is under way to complete the well dually in the Strawn formation between 11,204-11,642 ft.

Mobil owns a one-half interest in the area, with Western Natural Gas Co. holding the other half.

group frac treatment of five flood producers gives 7-day payout

A waterflood operator boosted production 153 bopd by fracturing five wells. The cost of all five treatments was paid out with less than seven days production.

This story illustrates how Dowell engineers work with operators to help them boost profits and hold down operating costs.

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Pay was the El Dorado Shallow Sand in Butler County, Kansas. Depth ranged from 550 to 760 feet. Waterfrac was employed. 2600 gallons gelled water, 5000 pounds 20-40 mesh sand and 2000 pounds 10-20 mesh sand were used for each well. Average injection rate was 12.5 bpm.

Total oil production from the five wells before treatment was 21 bpd. Stabilized production of oil after treatment was 174 bpd . . . an 8-fold increase. Net sale price for oil was $3.00 per barrel.

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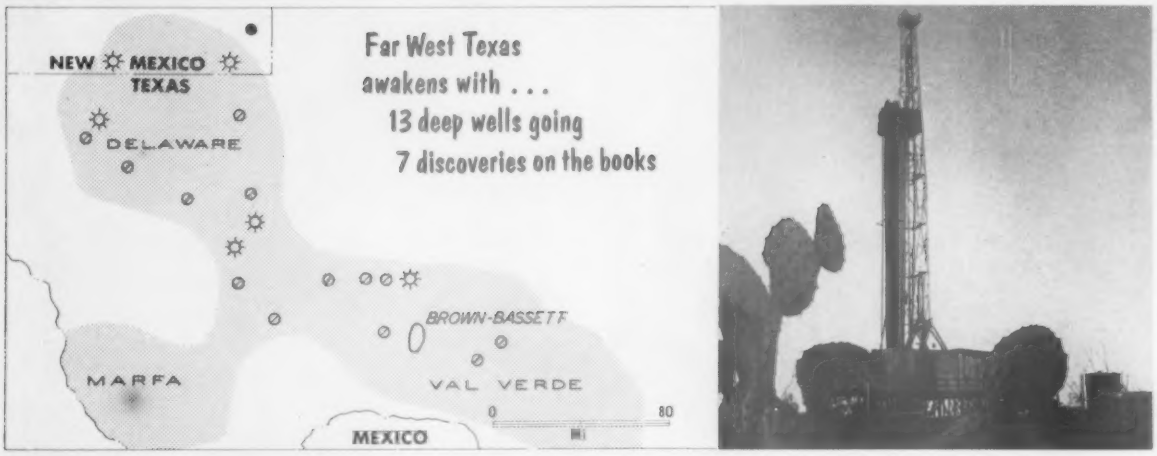

THIS YEAR'S top exploratory stories will likely come from far western Texas.

Drillers look to Texas as

Three basins hold wildcatting interest

ONE OF LAST YEAR'S exploratory excitement centers is back in the news in earnest. Two West Texas wet basins and one dry oil-hunting ground seem destined to snare this year's wildcat business.

It took a long time

. . . for one of the country's largest basins, the Delaware, to come into its own as a promising oil and gas reserve. The search for production in this vast area has been long and arduous. For the most part, until last year, the search was all but uneventful.

Since early in 1960 seven important deep-zone discoveries have breathed fire into what was becoming a damp campaign. All seven of these strikes were of extreme importance to this far-western Texas corner. The objective of this spirited trek into the Delaware country is the big pre-Permian section. Interest in deep exploration in the west-of-the-Pecos territory has been going on for years, but three big gas strikes last year did the trick.

Mobil Oil Co. tapped Rojo Caballos field at 1 Kathleen Moore, finding 102 M.M.c.f.d. from Pennsylvanian at 15,041-47 ft. Atlantic Refining Co. opened Hershey field at 1 Kelly, giving Texas its deepest producer from perforations at 15,800 to 16,680 ft. in four zones, Devonian, Silurian, Fusselman-Silurian, and Montoya Ordovician. Humble Oil & Refining Co. and Shell Oil Co. tapped 30 M.M.c.f.d. from Ellenburger, Connell-Simpson, and Pennsylvanian Detrital from 9,993-10,092 ft., opening Yucca Butte field. All three of these significant hits are in Pecos County.

Pecos doesn't get them all

. . . because the extreme western and northern slabs of the basin boasted four important gas and oil finds. Mobil got 13,500 M.c.f.d. at its 1 State-Barrett in Culberson County from the Pennsylvanian Strawn at 5,814-47 ft. Up in Eddy County, Southeast New Mexico, Gulf Oil Corp. 1 Estill flowed 46,800 M.c.f.d. from Permian-Wolfcamp at 9,806-16 ft. Ohio Oil Co. gave Lea County a big oil discovery at 1 Lea unit federal.

Flow was 516 bbl. per day from Permian Bone Spring at 9,480-9,550 ft. and the Devonian at 14,347-14,489 ft. The northeast side of the basin added further interest as a result of Continental Oil Co.'s 6 Bell Lake unit well. It flowed 30,500 M.c.f.d. from the deep Devonian at 14,568-14,829 ft.

Delaware is with us

. . . all the way. There are 13 wildcats working in remote sections of the Delaware-Val Verde basin region, all heading for rocks of pre-Pennsylvanian age. We will see some 20,000-ft. holes in this country this year. The days of hesitancy in the Delaware basin seem to be at an end.

Last year's big strikes and this year's promising wildcats, some of which are already showing for commercial production, should make this the most worthy oil and gas province in the line. Wildcatters don't seem to be staying in one spot in the basin. The northern side is catching it, Culberson County on the far west end is being worked, and the southeast Val Verde lobe has two deep ones going.

Even the Marfa basin, one of Texas' last wildcat frontiers, recently saw a deep hole meet failure. There has been very little drilling in that small basin, but the recent dry hole shouldn't settle the dust any. Recent extensions in and around big Brown-Bassett multipay field in Terrell County have boomed this field into one of the country's gas giants. These pages once passed off Delaware and its neighbors in fine print, but we can assure you there will be lots of news out that way in the coming months.

—John C. McCaslin

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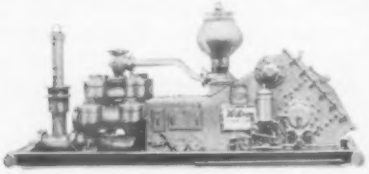

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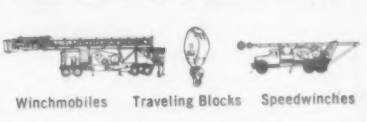
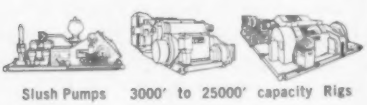


Winchmobiles Traveling Blocks Speedwinches



Slush Pumps 3000' to 25000' capacity Rigs

Ohio well is completed

In Ohio, James Drilling Corp. of Blairsville, Pa., has completed its 2 Weikko Warpula, NW¼ Lot 21, Monroe Township, with a natural open flow of 8,500 M.c.f.d. from the Oriskany sand which was topped at 2,005 ft.

This well now confirms the new Shearer gas pool recently discovered by James Drilling Corp.'s 1 Weikko Warpula, Monroe Township, which came in with a natural open flow 7,750 M.c.f.d. at 2,041 ft. with a rock pressure of 850 psi., according to James I. Shearer, president of James Drilling Corp., who discovered Shearer pool in Bethlehem Township, Coshocton County, in 1952.

Ohio's Cottage Hill moves eastward

In Ohio, two successful tests by Natol Corp. moved Cottage Hill pool in Hopewell Township, Muskingum County, eastward.

The 1 William Clements, Section 3, flowed 100 bbl. in a 24-hour test after fracture and the 2 William Miller, Lot 7, 1 Qt., 200 bbl. with a rock pressure of 650 psi. The Clinton sand was logged at 3,256-90 ft. and 3,179-3,223 ft. respectively.

A second good Newburg producer was completed in southwest Richland Township, Holmes County in a new development in this area. Oil Well Drilling Co. 3 Charles Crider, Section 23, acidized to 2,700 M.c.f.d. with a rock of 1,080 psi. The pay was logged at 2,748-64 ft.

Texas' East Linden well hits three pays

COMPLETION of a new multiple-zone Cotton Valley well is reported by Fred Whitaker in the East Linden field, 5 miles southeast of Linden, in northeastern Texas' Cass County. It is the fifth well for this developing Jurassic field, and extends production more than a ½ mile east.

Initial completion is in two of three potentially productive zones. The third (middle) zone tested some gas and condensate, but final completion in it is being delayed pend-

WHEN YOU ENCOUNTER EXCESSIVE TORQUE, DRAG OR THE HAZARD OF STICKING DRILL PIPE AND CASING . . . .

SOUTHWESTERN

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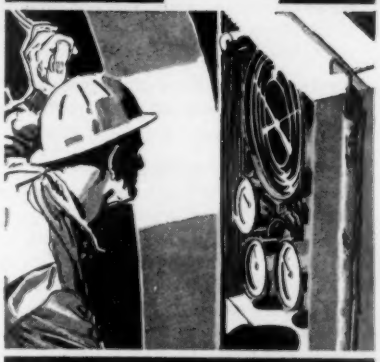

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GRAPHITE ROAD • BURNET, TEXAS

Pioneer underwater crude storage tanks cut offshore crude storage and oil handling cost by approximately 50%

The world's first underwater storage tank which went into operation last year in the Gulf of Mexico near Eugene Island, has cut barge loading time to a mere 4 hours, with resultant savings in both operating and equipment costs.

The unit, which was floated into position and then submerged 30 feet, consists of tubular storage sections 209′ x 88′, cross sectional tubing and above surface plat-

World's first underwater storage tanks operated by Ocean Drilling & Exploration Company.

forms for working equipment and housing. Crude flows directly into the tanks from offshore wells.

Keys to the success of this revolutionary installation include maximum utilization of space and speedy transfer of stocks.

How Stocks Are Transferred

Two Johnston vertical barge stripper-type pumps are used to transfer crude stocks directly from storage to barge. Each has a capacity of 1200 gpm or approximately 41,000 bpd. The pumps also handle seawater when required as some of the tanks are used to keep it on the bottom.

Pumping Features

The barge stripper-type pump selected has characteristics which make it most suitable for a transfer operation of this type. (See Fig. 1.) A multi-stage turbine bowl assembly is combined with a single stage propeller for maximum suction lift without vapor lock. A vent line with manually operated valve primes the suction lines and strips the compartments to their lowest practical level. An equalizer line, running from the turbine bowl unit to a point immediately above the propeller unit insures against possible vapor lock of the turbine impellers. The pump primes itself at low fluid levels through the action of the propeller booster. The entire pump assembly can be lifted from position for maintenance or repair without disturbing piping because of in-line construction. Surface space requirements, of course, are at a minimum.

Johnstons have been working for experienced oil operators in many ways for more than 50 years—in refineries, pipe lines, water supply, secondary recovery—and now in offshore. A trained field man will be glad to give you complete information or show how Johnston can best serve in *your* operation. Just call or write for an appointment.

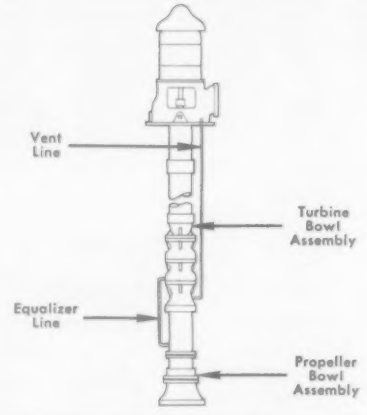

Fig. 1

JOHNSTON PUMP COMPANY

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ing additional testing later this year.

Zones potentialed are perforated at 9,754-62 ft., 9,768-74 ft., and 9,792-96 ft.; and 10,516-23 ft., 10,527-32 ft., 10,538-41 ft., 10,549-58 ft., and 10,561-64 ft. The middle zone is perforated at 10,284-94 ft.

Flow from the uppermost zone was gaged at 194 bbl. of 50°-gravity oil daily through 12/64-in. choke. Gas-oil ratio checked 1,885 cu. ft. per barrel. and pressure 759 psi.

The 10,500-ft. pay made 258 bbl. daily through 14/64-in. choke. It had gas-oil ratio of 672 cu. ft. per barrel, and pressure of 515 psi. Gravity of the oil is 48°.

Pan American Petroleum Corp. opened the field in 1959 as one of the most important Jurassic discoveries up to that time. Discovery well is completed in three zones.

Hoffman well in Texas taps deep Wilcox

Deep Wilcox production has been found in the old Hoffman area of western Duval County, Southwest Texas. Previous production in the area has been from Frio, Jackson, and Yegua sands at depths of 1,700 to 3,200 ft. The new Wilcox production is at 10,336-70 ft.

The Wilcox discovery well, Jake L. Hamon and others' 15 Duval-Hoffman, originally was drilled in 1944, quitting in Queen City at 6,823 ft. Present operators deepened the hole to 11,759 ft.

Tested through 10/64-in. choke, the well flowed at the rate of 2,520 M.c.f.d. of gas with pressure of 4,585 psi.

Texas' McFaddin yields new quintuple completion

The second quintuple oil and gas completion has been made successfully in McFaddin field, in southern Victoria County, Central coastal Texas.

In addition to the two quintuples, McFadden field also has a sextuple well, completed earlier this year on an adjoining lease. All three completions have been made by Sunray Mid-Continent Oil Co.

The sextuple completion was the second ever made. The first, also by Sunray Mid-Continent, was made last year in the North LaWard field, in adjoining Jackson County.

The new well is oil-productive from perforations at 5,471-75 ft., and gas-productive from pays at 5,130-35 ft., 5,225-30 ft., 5,514-19 ft., and 5,630-35 ft.

The oil zone flowed 123 bbl. daily through ⅛-in. choke with flowing pressure of 650 psi., and gas-oil ratio of 569 cu. ft. per barrel. Gravity of the oil is 38.2°. Over-all gas potential is 34,200 M.c.f.d.

Prolific wells being tapped in Illinois field

Big oil production is reported in a comparatively new producing area of White County, Illinois, 3 miles west of Crossville.

The pay is O'Hara Mississippian lime, a new producing section here, opened last summer. Slagter Producing Co. 2 P. L. Barbre, SW SW SE 20-4s-10e, flowed 528 bbl. per day from 3,133-50 ft. Dee Drilling Co. 1 Lemual Armstrong, SE SE SW, flowed 673 bbl. per day at 3,148-60 ft. The 1 Stokes-White, SW NW SE, flowed 514 bbl. per day at 3,158-68 ft. Other completions include Dee 1 Lamar-Williams, SE NE NW 29-4s-10e, flowing 585 bbl. per day from 3,129-48 ft., the 2 Lamar-Williams in NE NE NW, flowing 700 bbl. per day at 3,131-47 ft., Slagter 2 Amanda Spencer "A," W½ NW NE, flowing 408 bbl. per day from 3,123-33 ft.

Clay County. Alex Zanetis et al. have the second St. Louis Mississippian producer in a new area 3 miles southeast of Flora. The well, 1 C. D. McCommons, SW SW NE 9-2n-7e, flowed 240 bbl. per day from 3,149-58 ft., natural.

North Texas field adds two new producing wells

Potential is reported at two wells in Conley multipay field, 8 miles west of Chillicothe in Hardeman County, northwestern North Texas.

Shell Oil 1 D. T. Wilson et al. flowed 166 bbl. of oil daily through 22/64-in. choke from Mississippian perforations at 7,950-8,076 ft. Earlier the well flowed 83 bbl. per day from Osage perforations at 8,095-8,120 ft. Shell also finaled 1 W. H. Flynn as a dual Mississippian and Ellenburger well on the northeast side of the field. The well flowed 241 bbl. per day through 16/64-in. choke from Mississippi at 7,741-7,901 ft.; from Ellenburger at 8,199-8,244 ft. the well flowed 236 bbl. per day on 12/64-in. choke. Location is in Section 80, Block H, W&NW Survey.

Ten-well program started in California

A ten-well drilling program in Helm field, Fresno County, California, has been started by Nordon Corp., Ltd., Los Angeles.

The first well is drilling ahead toward a target depth of 7,000 ft. to test the fields productive Miocene sands. The well, Noble 4-9, is located in 9-17s-18e less than ½ mile from present producing wells.

Nordon kicked off the drilling program after receiving a $175,000 loan and $500,000 worth of credit from the California Bank, Los Angeles. The bank has a 50% oil payment from Nordon's Helm wells to repay the loan and 6% interest.

Nordon has three wells making a total of 525 bbl. daily on the Helm property.

it's powered by a 37-hp WISCONSIN

WISCONSIN-POWERED pneumatic bulk transport consists of a trailer-mounted Dowell twin-pump unit and a 37-hp Wisconsin Engine direct-connected to a Gardner-Denver air compressor.

air-operated bulk transport speeds cementing of oil wells

The Wisconsin-powered unit shown is tailored for fast, low-cost cementing of oil wells. Its capacity of 590 cu. ft. at a discharge rate in excess of 50 cu. ft. per minute assures continuous mixing and cementing, regardless of job size.

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The 37-hp VG4D is precision-built for continuous mixing and cementing. Its high torque takes changing loads in stride without stalling. Heavy-duty design and air cooling combine to give the most power service with the least care over a wide range of temperatures.

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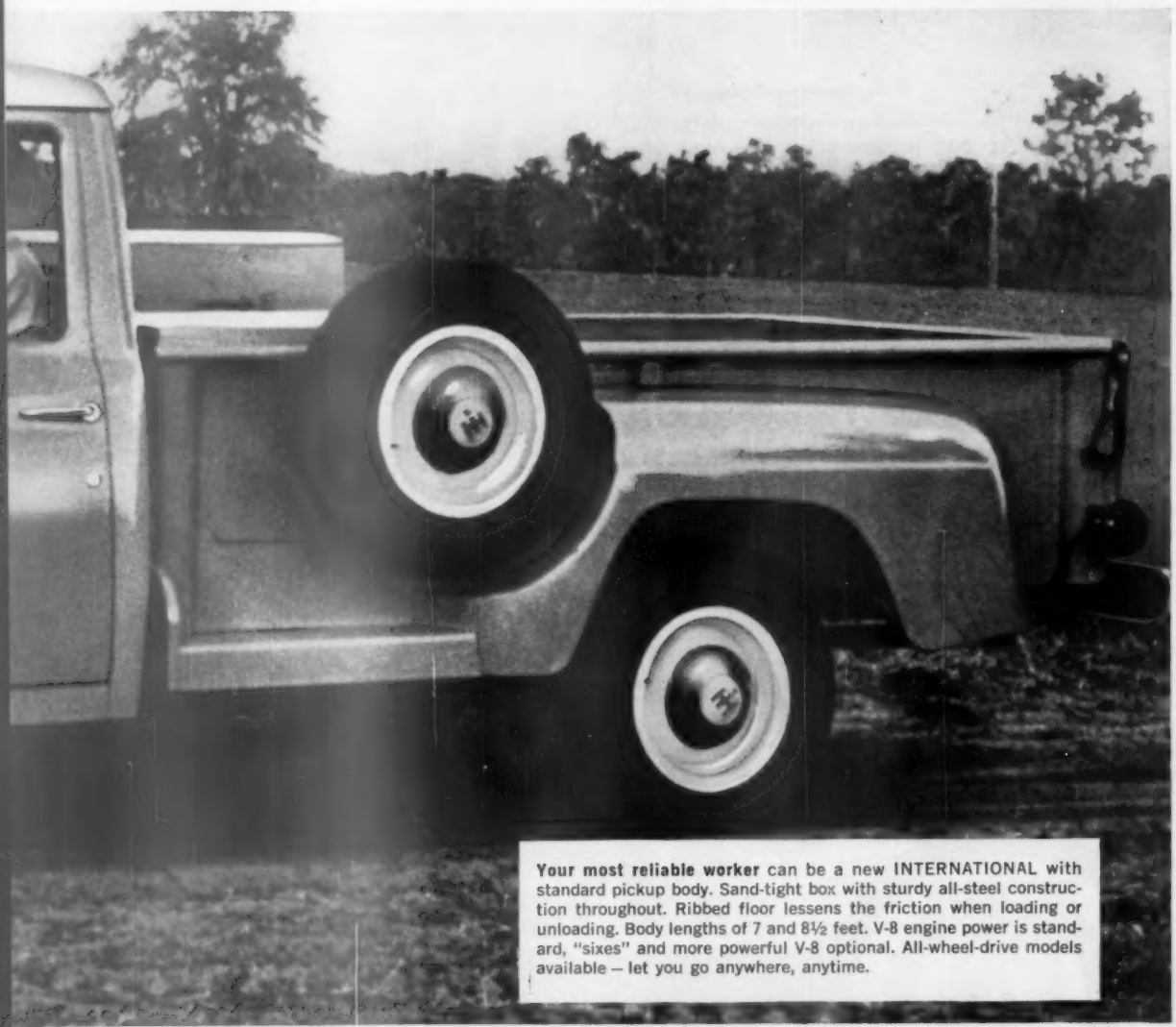

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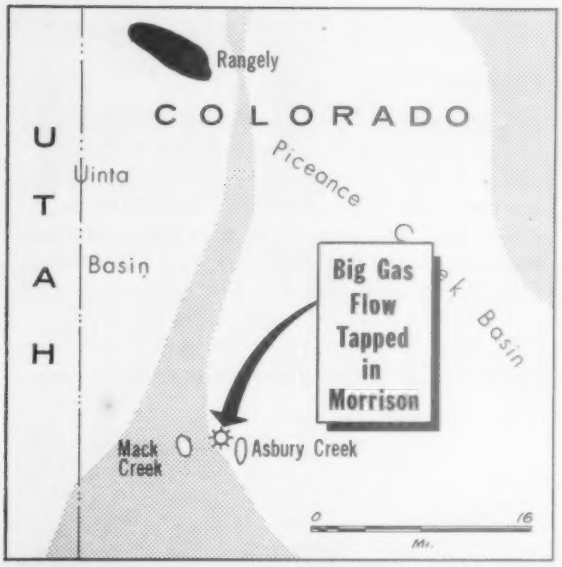


MORRISON JURASSIC GAS is reported at a wildcat in Mesa County, western Colorado.

Piceance adds prolific gasser

GOOD gas production is reported at a wildcat on the west edge of the Piceance Creek basin in Mesa County, western Colorado. Discovery well is Frontier Refining Co. 1 Christiana-Government, SW SE 9-9s-101w.

The well flowed 25,500 M.c.f.d. from Morrison at 2,599 ft. Location is about 2 miles northwest of Asbury Creek, a one-well field, and 6 miles northeast of Mack Creek field.

Southeast. In the extreme northwestern corner of the Anadarko basin in Baca County, southeastern Colorado, Horizon Oil & Gas Co. completed 1-15 Homsher in C NW SE 15-33s-42w, flowing 2,700 M.c.f.d. from Topeka Pennsylvanian perforations at 3,045-55 ft. This well is ¾ mile northeast of Midway field, completed in 1960 flowing 8,450 M.c.f.d. from Morrow and Topeka. A recent stepout, 1 mile northeast, was completed in C SW 14-33s-42w, flowing 1,750 M.c.f.d.

Two gas wildcats planned

Occidental Petroleum Corp. has started two more wildcats in its search for more gas in California's Sacramento Valley.

Both tests will be drilled in Sutter County.

The 1 Mezger was just spudded in 10-12n-2e. The target depth of 9,000 ft. will test the Upper Cretaceous sands of the F zone. The well will be the second on the company's 6,500-acre block in the Robbins area. Earlier a dry hole was drilled on the acreage.

Occidental also plans to drill the 1 J. L. Browning in 19-16n-1e. This well will be an 8,000-ft. test. The 1 Browning is located in the West Butte area 2¼ miles northeast of production in Butte Slough field, a one-well field.

Deeper pool discovered in West Grimes gas field

West Grimes gas field in Colusa County, California, continues to come up with exploration developments.

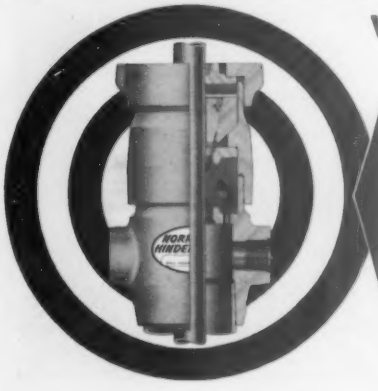
The two operators in the field, Occidental Petroleum Corp. and Gulf Oil Corp., both completed significant wells in the field recently. Occidental has found a deeper pay and Gulf has extended production in the field.

Occidental's 2 Sachreiter is the new deeper pool discovery. The well flowed at a rate of 14 M.M. c.f.d. from 7,795-7,810 ft. Flow was through a ½-in. bottom-hole choke and ¾-in. surface choke. Final bottom-hole pressure was 4,185 psi. compared with an initial bottom-hole pressure of 5,545 psi. The well is in 4-14n-1w.

The operator also tested a pay sand at 7,710-31 ft. and gaged a flow of 6,570 M.M.c.f.d.

Gulf's 1 C. B. Stoddard, located in Section 9 south and slightly east of the 2 Sachreiter, flowed at the rate of 10,830 M.c.f.d. during a production test of a perforated interval at 7,662-92 ft. The flow was through a ⅜-in. choke with a shut-in surface pressure of 4,580 psi.

The 1 C. B. Stoddard and Occi-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dental's discovery well, the 1 Sachreiter, flow from the same Upper Cretaceous sands in the F-2 zone.

Gulf's first well in the field, the 1 Stapp in Section 3, discovered a shallow sand (OGJ, Feb. 13, p. 61). The 1 Stapp produces from 6,968-7,022 ft.

The four wells are the only ones drilled in the 3-month old field, but both operators are expected to make additional hole on their West Grimes acreage.

Discovery wells

CALIFORNIA

Kern County:

Texaco Inc., 1 Brandt, center SE SE 8-29s-24e. Flowed 1,640 M.c.f.d. through ¼-in. choke with surface flowing pressure of 1,051 psi. from perforations at 4,157-63 ft. and 4,179-85 ft. Extends production in Bowerbank field 1¼ miles northwest.

WESTERN CANADA

Alberta:

Swain 8-15 Leafland, LSD 8, 15-40-5w5. Cardium oil discovery. TD 6,065 ft.

Phillips 10-7 Kaybob, LSD 10, 7-64-18w5. Notikewin gas discovery. TD 4,900 ft.

British Columbia:

Western Natural Gas Co. B-30-F Kathy, 30-F-94-P-3. Slave Point gas discovery. TD 6,687 ft.

Saskatchewan:

American 16-22 Liberty, LSD 16, 22-6-1w2. Alida beds oil discovery. TD 3,840 ft.

COLORADO

Washington County:

Tipps Drilling Co. 1 Downing, C SW NE 20-3s-53w. IPP 50 BO, 60 BWPD, "J" sand 4,708½-13½ ft. TD 4,777 ft. "J" sand discovery, new field.

SOUTH LOUISIANA

Terrebonne Parish:

Argo Oil Corp. 5 Southdown Sugars, 2-18s-16e. IP 6,100 M.c.f.d., 14 BOPD, 12/64-in., 38.1°, 3,990 psi., perf. 12,115-25 ft. and 12,130-40 ft.; 6 M.M.c.f.d., 48 BOPD, 17/64-in., 41.5°, 3,275 psi., perf. 11,683-93 ft.; 1,100 M.c.f.d., 9.36 BOPD, 16/64-in., 43.5°, 1,100 psi., perf. 11,525-35 ft. TD 12,425 ft. New pays in Sunrise field.

NEBRASKA

Banner County:

Jul-Tex Drilling Co. 1 Mead-A, C NW SW 34-20n-55w. IPP 28 BOPD, "J" sand 5,411½-13½ ft. TD 5,550 ft. "J" sand discovery, new field.

Cheyenne County:

Midwest Oil Corp.-Tom Jordan 1 State, NE SE 36-17n-50w. IPP 216 BOPD, "J" sand 4,721-43 ft. TD 4,820 ft. "J" sand discovery, new field.

NEW MEXICO

Chaves County:

Wayne J. Spears 1 Zimmerman, 8 miles southeast of Roswell in 35-10s-25e. IPP 39 BOPD, 24°, Slaughter 1,219-27 ft. TD 1,230 ft. New oil discovery.

Eddy County:

Earnest A. Hanson 1 Hondo-State, 7 miles northwest of Maljamar in 24-16s-31e. IPP 37 BOPD, plus 74 BWPD, 35°, 3,628-46, 4,079-95, 4,188-4,200 ft. TD 4,218 ft. New oil discovery.

Lea County:

Aztec Oil & Gas Co. 1 Northeast Maljamar unit, 4 miles northeast of Maljamar in 5-17s-33e. IPF 210 BOPD, 28/64-in. choke, TP 100 psi., packer, Penn. 10,858-98 ft. TD 12,510 ft. New oil discovery.

Nearburg & Ingram 1 Midhurst, 35-12s-37e. IPF 433 BO and BW/20 hours, 22/64-in. choke, 54°, GOR 1,975:1, TP 600 psi., packer, Pennsylvanian 11,119-24 ft.; IPF 456 BOPD, 16/64-in. choke, 52°, GIR 650:1, TP 675 psi., packer, Devonian 12,188-98 ft. TD 12,228 ft. Dual oil discovery, Pennsylvanian new pay in Gladiola field.

EAST TEXAS

Marion County:

Amerada Petroleum Corp. 1 Chew Estate, H. Black Sur., A-28, 5 miles southeast of Smithland. IPP 52 BOPD, 45.2°, perf. 2,236-39½ ft., Tokio. TD 2,265 ft. Extends Marion Shallow field 1½ miles southwest.

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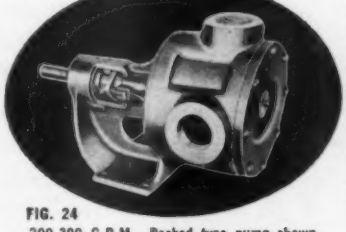

FIG. 24
200-300 G.P.M. Packed type pump shown with tapped ports

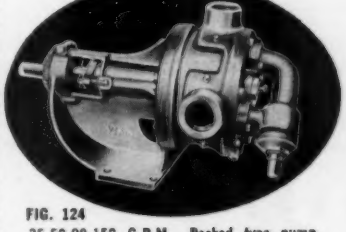

FIG. 124
35-50-90-150 G.P.M. Packed type pump shown with valve on head

If you're a truck operator, who wants good service for years plus the right capacity to meet your needs, Viking truck mounting pumps were made for you. They're dependable! Ask the man who operates a Viking pump-equipped truck. Capacities from 35 to 300 G.P.M. available.

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Mobil Creates a Big New Job

. . . and picks a top man for it. Fred Moore, company's first executive vice president, has varied background.

THE LINE that customarily forms at the door of a company president has been shorter at Mobil Oil Co. since the post of executive vice president was created last month.

Key man in this revision of management structure is Fred H. Moore, holder of the new job. He has been given responsibility for marketing, manufacturing, pipelines, traffic, and supply and distribution, and reports for these groups to the president.

In the operating departments, only the vice president of exploration and producing continues to report directly to Herbert Willetts, Mobil Oil's president.

Thus the president no longer has to concern himself with details to make sure various functions are shooting at the same target. He is free to devote more thought to policy decisions and long-range planning.

Besides, grouping of these departments under a single executive below the president brings them into better perspective. Management expects to be able to spot new profit opportunities when operations are examined in this manner.

Fred H. Moore
. . . thrives on nomadic life.

Man on the move . . . Moore has been a man on the move since his college days.

A native of Comanche, Tex., he took a BA from Texas Technological College in 1930 and an MA from the University of Virginia the following year. He attended Yale's Graduate School of Geology in 1933.

He joined Magnolia Petroleum Co.—now merged into Socony Mobil, the parent company—in 1935. And he began a tour that took him to most of the principal oil states in the U. S. and to Canada as well.

Moore became staff geologist for Magnolia in Dallas in 1949. He was appointed assistant to the president in 1951, and attended the advanced management program at Harvard that year. In 1952 he was named manager of crude-oil purchases and sales.

Four years later, Moore was made executive vice president and general manager of Mobil Oil of Canada, Ltd., in Calgary. The next year he was transferred to New York as manager of the producing department of Socony Mobil Oil Co., Inc., the parent company.

He returned to Dallas in 1959 as executive vice president and director of Magnolia. When Magnolia merged with the parent firm that year, he went back to New York as exploration and producing vice president for Mobil Oil, the job he held until his promotion to executive vice president early last month.

Variety is the spice . . . This personable Texan thrives on variety.

"Each new job and new place opened a door and gave me a greater appreciation of other people's problems and responsibilities," he says. "Once I was out of geology, every job added to my inventory of varied experience."

Moore credits the time he has spent in crude-oil purchases and sales for a sharper insight into overall operations.

A "nomadic" life has brought no complaints from Moore's wife and two daughters.

"Now we feel at home anywhere," he says.

▶▶▶ Personals

Robert L. Gollnick, senior staff geologist with Ralph E. Davis Associates, has opened consulting offices in Houston. Gollnick was with Humble before joining Davis Associates.

Dr. Souren Z. Avedikian is director of Lummus Co.'s expanded engineering-development center in Newark, N. J. **Ward J. Bloomer** is manager. Heading four operating departments at the center are **Dr. Sidney B. Tuwiner,** manager of the chemical and metallurgical department; **Dr. Hoke S. Miller,** manager of the radiochemical and electrochemical department; **Stephen M. Karwan,** manager, petroleum, petrochemical, and coal department; and **Thomas M. Bennett,** manager, pilot plant construction department.

Walter D. Nielsen and **I. E. Ary** have joined California Research Corp.'s Richmond, Calif., laboratory as research chemists. **John J. Geser** and **Tony K. Ling** have joined the Richmond lab as research engineers and **Barbara W. Clarke** has been named literature chemist there. **S. A. Amba** has joined the La Habra, Calif., laboratory as research engineer.

Jerry D. Stafford has been named operations superintendent for Atlantic Refining Co.'s Canadian division, Calgary. He had been assigned to Atlantic's Dallas petroleum-engineering section.

Charles Skjod, Amerada Petroleum Corp., has been elected 1961-62 president of Dakota Petroleum Club. Other new officers are **Jerry Kennedy,** Deister, Ward & Witcher, vice president; **Frank Alexander,** Texaco, secretary; and **T. F. Keating,** Mobil Oil Co., treasurer. Directors are **Willard Burton,** California Oil Co.; **Clyde W. Jones,** independent; and **Steven H. Harris,** consulting geologist.

Donald R. Nelson, general manager of marketing for Leonard Refineries, Inc., has joined Plymouth Oil Co. as manager of marketing for the Republic division.

E. W. Webb, Houston, senior vice president of Continental Oil Co., has retired after 34 years with the company. Webb was manager of production for the company before being named a vice president in 1951. He became senior vice president in 1958.

William W. Clawson, manager of exploration for Mobil Oil Co. since 1959, has retired after 27 years with the company. Clawson has served as president of Mobil Producing Co. and Mobil Oil of Canada, coordinator of domestic production for Socony Mobil, and vice president, director and senior vice president of Magnolia Petroleum Co.

Roy J. Diwoky, chairman of Commonwealth Oil Refining Co., Inc., has joined Crown Central Petroleum Corp. as chief executive officer. **S. K. Waters,** president and chief executive officer of Crown Central since 1955, will become chairman of the executive committee.

Dr. Theodore A. Link, J. A. Downing, and **D. Y. Cooke** have left Cree Oil of Canada and North Star Oil, Ltd., to form Link Downing Cooke & Co., Ltd., exploration and production consulting firm with headquarters in Calgary. The three men were founders of Cree Oil in 1956. Cree was merged with North Star in 1958 and both companies are now subsidiaries of Shell Oil Co. of Canada.

Lee D. Webster, Katz Oil Co., has been elected chairman of the West Central Texas section of AIME's Society of Petroleum Engineers. He succeeds **Phil Bridges,** Russell Engineering. Other new officers are **H. W. Deats,** Texas Pacific Coal & Oil Co., first vice chairman; **F. A. Hunter,** General Crude Oil Co., second vice chairman; and **Bill Brogdon,** Halliburton Co., secretary-treasurer. Directors are **Bill Sittig,** Shell Oil Co.; **Lewis Williams,** Sun Oil Co.; **Benton Riddel,** Welex, Inc., and Bridges.

Walter E. McDonald, Pan American International legal department, has been named manager of negotiations for the company.

John M. Hoffmann, petroleum engineer with Ohio Oil Co., has been transferred to Seminole, Tex., from Hobbs, N. M.

John Holiway, manager of the light-oils section at DX Sunray Oil Co.'s Tulsa refinery, has retired after 45 years with the company.

Willis J. Gibson, operations adviser in Toronto for Imperial Oil, has been transferred to Calgary as assistant manager of production, crude oil. **R. V. Welch,** Calgary, has been named assistant manager of production, natural gas.

Larry W. Funkhouser, southeast Louisiana division superintendent for The California Co. division of California Oil Co., has been transferred to Standard Oil Co. of Texas as Midland, Tex., division exploration superintendent. **Alan V. Martini,** area geologist for Calco, will succeed Funkhouser.

C. D. Hill, area marketing manager for Humble Oil & Refining Co. in Billings, Mont., has been given a temporary assignment as acting regional marketing manager in Tulsa. During Hill's assignment in Tulsa **G. T. Phipps** will be acting marketing manager in Billings. **J. F. Fleming** will handle Phipps' duties as assistant area marketing manager.

Charles A. Campbell, technical foreman in the fluid-coking area at Tidewater Oil Co.'s Delaware City, Del., refinery, has been promoted to supervisor of the new petrochemical area. **Raymond K. Arzinger,** technical foreman in the crude-processing area, has been named technical foreman in the petrochemical area. **Robert L. Melson,** staff assistant to the division manufacturing manager, will succeed Arzinger. **Charles S. Joanedis,** staff assistant to the refinery superintendent, will replace Melson. **William E. Baston,** technical foreman, reforming and extraction, will succeed Campbell in the coking area, and **Joseph A. Dunphy, Jr.,** assistant coordinator in the New York office, has moved to Delaware to succeed Baston.

▶▶▶ Personals

William R. Stott, vice president and a director of Standard Oil Co. (N. J.), has been elected an executive vice president and member of the executive committee. He succeeds **Emile E. Soubry,** who relinquished his post as executive vice president and executive committee member March 1, and will retire as a director in May. **Peter T. Lamont,** and **Stewart P. Coleman,** vice presidents and directors of Jersey, are also retiring from the board. **Paul J. Anderson,** Jersey Standard representative for the United Kingdom, Scandinavia, and Middle East representative in London; and **W. A. M. Greeven,** regional coordinator for Europe, the Mediterranean area, and West Africa, have been nominated for election as directors. Their election and retirement of Soubry, Lamont, and Coleman will bring number of Jersey directors down from sixteen to fifteen.

STOTT

ANDERSON

GREEVEN

J. O. Sanders, assistant general manager of production for The California Co. division of California Oil Co., has been appointed general superintendent, production department, a new position. **H. E. Denzler,** marine maintenance supervisor, has been named assistant to the general superintendent. The new unit headed by Sanders will include **A. L. Smith,** supervisor of offshore platform construction and installation; **F. C. Jacobs,** supervising engineer of marine maintenance and mobile-drilling rig engineering; **C. A. Christensen,** superintendent of transportation; and **H. D. Stiles,** manager of aircraft operations.

Personals

Peter I. Bediz, president of Century Geophysical Corp. of Canada, has been elected president of Canadian Society of Exploration Geopsysicists. He succeeds **Milton B. Dobrin,** Triad Oil Co. Other new officers include **Jack M. Desmond,** Western Geophysical Co. of Canada, vice president; **Rodney J. H. Smith,** Imperial Oil, secretary; and **Nash H. Miller,** United Geophysical Co. of Canada, treasurer.

BEDIZ

A. J. Smith, district superintendent for Colorado Oil & Gas Corp. in Liberal, Kans., has been promoted to production superintendent in the Mid-Continent division. He will headquarter in Denver.

W. T. Hudson, Phoenix consulting geologist, has been elected president of the newly organized Oil and Gas Association of Arizona. Other officers are **Van D. Bennett,** Valen Oil & Minerals Corp., vice president; and **Earl Rodman, Jr.,** Phoenix petroleum engineer, secretary-treasurer. Executive committee members will be **R. P. Davidson,** Phoenix attorney, **Gordon Fleetwood,** Phoenix consultant, and the officers.

G. T. Pearson, president of Hudson's Bay Oil & Gas Co., has been elected chairman of Canadian Petroleum Association's Alberta division board of directors. He succeeds **Dr. W. C. Howells,** Texaco Canada, who has been named a director. **A. E. Feldmeyer,** Canadian Superior Oil of California, has been elected vice chairman. New directors are **E. A. Galvin,** Medallion Petroleums; **J. F. Hardy,** Central-Del Rio Oils; **Charles Hay,** Royalite Oil Co.; **F. M. Jacobson,** Amurex Oil; **C. S. Lee,** Western Decalta Petroleum; **T. Nitescu,** Canadian Fina Oil; **F. C. Osment,** Pan American Petroleum Corp.; **E. W. Scott,** Union Oil Co.; **S. W. Shambaugh,** Reading & Bates Drilling Co.; **S. Stewart,** Richfield Oil Corp.; and **E. Trafford,** Colorado Oil & Gas.

J. Roger Kearns, petroleum engineer for Ohio Oil Co., has been transferred to Bridgeport, Ill., from Robinson, Ill.

John J. Arps, vice president of British-American Oil Producing Co., has been named Dallas' outstanding petroleum engineer for 1961 by the Dallas section of AIME's Society of Petroleum Engineers.

J. E. Embry, general superintendent of production for Arkansas Fuel Oil Corp., has been named superintendent of joint-interest operations, a new position in Cities Service Petroleum Co.'s production division. Embry moved from Shreveport, La., to Bartlesville, Okla., earlier this year and he will continue to headquarter there.

R. C. Loeris, geologist, and **M. A. Young,** geophysicist for Humble in Worland, Wyo., have been transferred to Casper, Wyo. Also, **P. F. Kelly,** geophysicist, has been transferred from Casper to Billings, Mont., **C. V. E. Calbick,** Billings geophysicist, has been moved to Casper, and **Herman A. Mundt,** land man, has been transferred from Worland to Durango, Colo.

G. D. Strother, Jr., central division engineer in Oklahoma City for Sunray Mid-Continent Oil Co., has been named district manager in Corpus Christi, Tex. He succeeds **A. E. Meissner,** recently named western division production manager in Denver. **J. E. Klipp,** western Oklahoma district engineer, will succeed Strother. **Myron Elliott,** field superintendent in Newhall, Calif., will succeed Klipp. **R. K. McIntyre,** Abilene, Tex., has been transferred to Hobbs, N. M., as district office manager.

Rex W. Reynolds, sales district manager in Portland, Ore., for Shell Oil, has been named sales manager of the Cleveland division. He succeeds **Charles F. Geig,** recently named manager of dealer services in the New York office. **Robert E. Seng,** district sales supervisor in Columbia, S. C., has been named district sales manager in Syracuse, N. Y. He succeeds **Andrew G. Nelson,** now northern Indiana district sales manager in South Bend.

Albert E. Sweeney, Jr., director of technical services for Interstate Oil Compact Commission, has joined Interior Department's Office of Oil and Gas as liaison with the Office of Civil Defense Mobilization. He will headquarter in Denton, Tex.

R. N. Ayars, Ohio Oil Co., has been elected 1961 president of API's Illinois Basin chapter. Other officers are **E. C. Robinson,** V. T. Drilling Co., first vice chairman; **L. A. Turner,** Gulf Oil Corp., second vice chairman; and **James Hopper,** Halliburton Co., secretary-treasurer.

Glenn L. Werly, special assistant to Mobil Oil Co.'s vice president for marketing, has been named president of the new Oil Heat Industry Organization Committee, formed by consolidation of Oil Heat Institute and National Fuel Oil Council. Werly is retiring from Mobil after 38 years service. He was general manager of domestic marketing before assuming his present post earlier this year.

Guillermo Rodriguez Eraso, special assistant to the president of Creole Petroleum Corp., has been elected a director of the company. Rodriguez joined Creole in 1945. He was assistant manager of Creole's economics department and spent a year with the producing-coordination department of Standard Oil Co. (N. J.) before being named assistant to the president of Creole.

J. E. Gardner, Jr., administrative superintendent in Humble Oil & Refining Co.'s Bayway refinery, Linden, N. J., has been named manager of fuel-products and general planning in Humble's manufacturing department, headquarters coordination and planning management. **T. J. Greaney, Jr.,** has been named manager of specialty-products planning in the department. Greaney has been acting manager of research and development at the Baytown, Tex., refinery. Gardner and Greaney will headquarter in Houston.

E. Duer Reeves, director and vice president of Humble Oil & Refining Co., **F. A. L. Holloway,** Humble vice president for manufacturing, and **Loren F. Kahle,** transportation coordinator of Standard Oil Co. (N. J.), have been elected directors of Esso Research & Engineering Co.

Madison Farnsworth, consultant to Gulf Oil Corp.'s marketing department, has retired after 27 years with the company. Farnsworth was division general manager of marketing in Houston before being named consultant last year.

Charles T. Carter has been elected a vice president of Sinclair Pipe Line Co. He will continue as director of engineering and a director of the company with headquarters in Independence, Kans. Carter has been with Sinclair since 1938.

Walter G. Horstman, Plantation Pipe Line Co.'s vice president, operations, has retired after 38 years in the oil industry. Horstman has been with Plantation since 1941. He was general superintendent before becoming operations vice president in 1952. **James A. Hatfield,** general superintendent, will take over Horstman's duties.

Philip G. McCarney, supervisor for Texas Eastern Transmission Corp., has been transferred to Linden, N. J., from Harrisburg, Pa.

Leslie T. Fournier, vice president of Panhandle Eastern Pipe Line Co. and Trunkline Gas Co., has been elected a director of National Distillers & Chemical Corp.

Philip E. Bolian, assistant traffic manager for Service Pipe Line Co., has succeeded **B. W. Russell** as traffic manager. Russell has retired. **Jerry C. Smith** will succeed Bolian.

S. L. Windham, general superintendent of pipelines for Coastal Transmission Corp. and Houston Texas Gas & Oil Corp., subsidiaries of Houston Corp., has been named general manager of distribution properties for the parent company. **Eldon Rolfe,** chief engineer for Houston Texas Gas & Oil, will succeed Windham as general superintendent of pipelines. **Jim Hoss,** chief engineer for Coastal will take on additional duties as chief engineer for Houston Texas Gas & Oil. **Talmadge Day,** chief accountant for Coastal, has been named internal auditor for Houston Corp. and its subsidiaries.

Charles R. Pierce, production superintendent in Union Oil Co.'s Amarillo division, Perryton, Tex., has been promoted to Woodward, Okla., production superintendent.

Murray E. Helmers, geophysical computer for Pan American Petroleum in Liberal, Kans., has joined Petroleum, Inc., in Great Bend, Kans., as geological engineer.

Ray Granlund has been named manager of supply and distribution east of the Rocky Mountains for Signal Oil & Gas Co. He will headquarter in Houston.

James E. O'Keefe has been appointed project construction manager of Monsanto Chemical Co.'s Chocolate Bayou petrochemical plant to be built near Alvin, Tex. **William K. Volz** has been named assistant director of engineering for the project. **Otto A. Klingler** has been named purchasing manager. Section managers appointed include **William L. Bolles,** ethylene plant design; **Frederick E. Rosenberger,** design of manufacturing facilities other than the ethylene plant; **B. G. Earnheart,** mechanical engineering and standards; **James R. Middleton,** instrumentation; and **Sidney B. Wilson,** nonmanufacturing facilities design.

▶▶▶ Personals

Ray C. Adam, manager of planning, analysis, and economics for Socony Mobil Oil Co. in New York, has been named vice president and general manager of manufacturing for Mobil Oil Co., a new position. He will be responsible for Mobil's 12 U. S. refineries with total capacity of over 700,000 bbl. daily. The refineries have been managed through Mobil's manufacturing department. **William H. Montgomery,** head of this department since 1959, has retired after 35 years with the company. Adam had been manager of operations at the Beaumont, Tex., refinery and manager of economics for Magnolia Petroleum before moving to New York last year.

ADAM

W. F. Eiting, Jr., Humble Oil & Refining Co.'s Mattoon, Ill., area manager, has been named assistant general manager in the central region office, Tulsa. **A. L. Deaton,** regional associate counsel in the Tulsa office, will succeed Eiting in Mattoon.

John Hancock, Sioux Falls, S. D., marketing division manager for Champlin Oil & Refining Co., has been named special assistant to **L. E. Hardin,** vice president of sales. Hancock will headquarter in Minneapolis. He will be secceeded in Sioux Falls by **John Acker,** Moorhead, Minn., division manager. **J. A. Stochl,** Omaha, will succeed Acker.

▶▶▶ Deaths

Vernon G. Schimmel, founder and president of the Texas Petroleum Co., San Antonio, Tex., died February 25 in a Del Rio, Tex., hospital after a long illness. Schimmel founded Texas Petroleum in 1929.

Carl A. McAdams, Albuquerque independent and president of New Mexico San Juan Natural Gas Co. before its sale in 1958, died recently in Albuquerque. McAdams organized New Mexico San Juan Natural in 1952.

Hunter Lee Johnson, 78, secretary and counsel for Papoose Oil Co., Tulsa, died February 22 in a Tulsa hospital after several months' illness.

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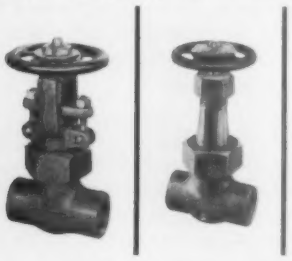
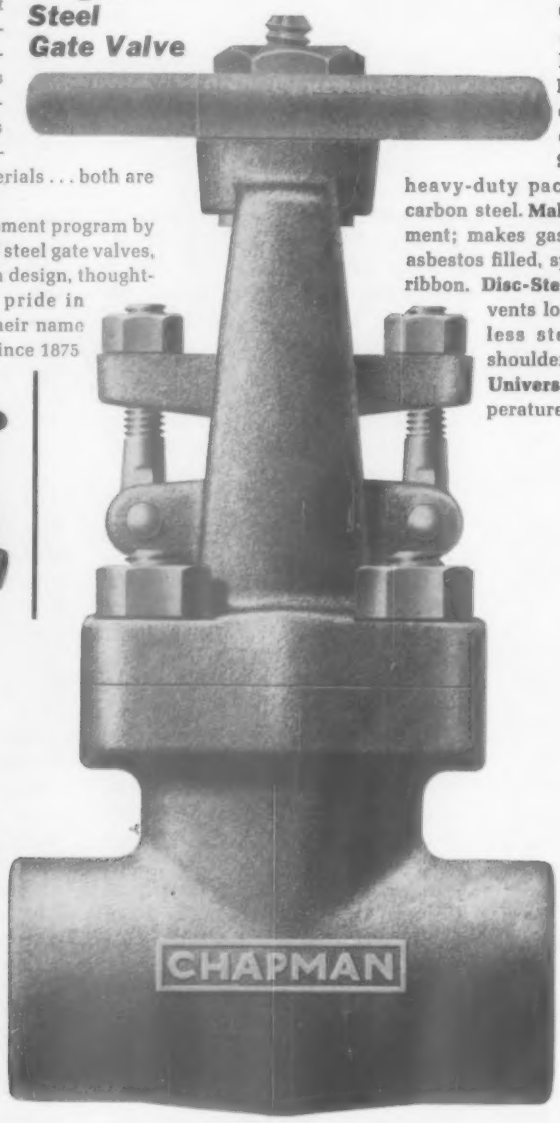
New Chapman 960B Rugged-Duty Forged Steel Gate Valve

In valves, "forgetability" is a true measure of worth. "Forgetability" is defined in terms of those qualities which allow a valve, once installed, to be almost forgotten. It results from perfection of performance, and year-after-year dependability; combined with less than moderate maintenance requirements. These characteristics are the outgrowth of knowledgeable design and excellence of materials . . . both are tradition with Chapman Valves.

Product of an all-inclusive development program by Chapman, the *originators* of forged steel gate valves, the 960B represents the integrity in design, thoughtful selection of materials, and pride in workmanship which have made their name synonymous with quality valves since 1875





Wheel . . . cast ductile iron. **Stem** . . . heat-treated stainless steel; backseats in bonnet. **Yoke Sleeve** . . . corrosion resistant Chapman alloy CV510. **Follower and Gland** . . . socket and ball type: bind-proof follower; stainless steel gland. **Eyebolts** . . . stainless steel; swing-down design. **Yoke** . . . "bowlegged" design for exceptional hand room. **Stuffing Box** . . . bigger, with special, heavy-duty packing **Bonnet and Body** . . . forged carbon steel. **Male-Female Joint** . . . for precise alignment; makes gasket blowout impossible. **Gasket** . . . asbestos filled, spiral-wound, flexible stainless steel ribbon. **Disc-Stem Connection** . . . sliding joint prevents load transfer. **Disc** . . . hardened stainless steel; guided travel. **Seat Rings** . . . shoulder type, Stellite-faced stainless steel. **Universal Trim** . . . all standard services; temperatures to 1000°F; pressures to 2000 psi.

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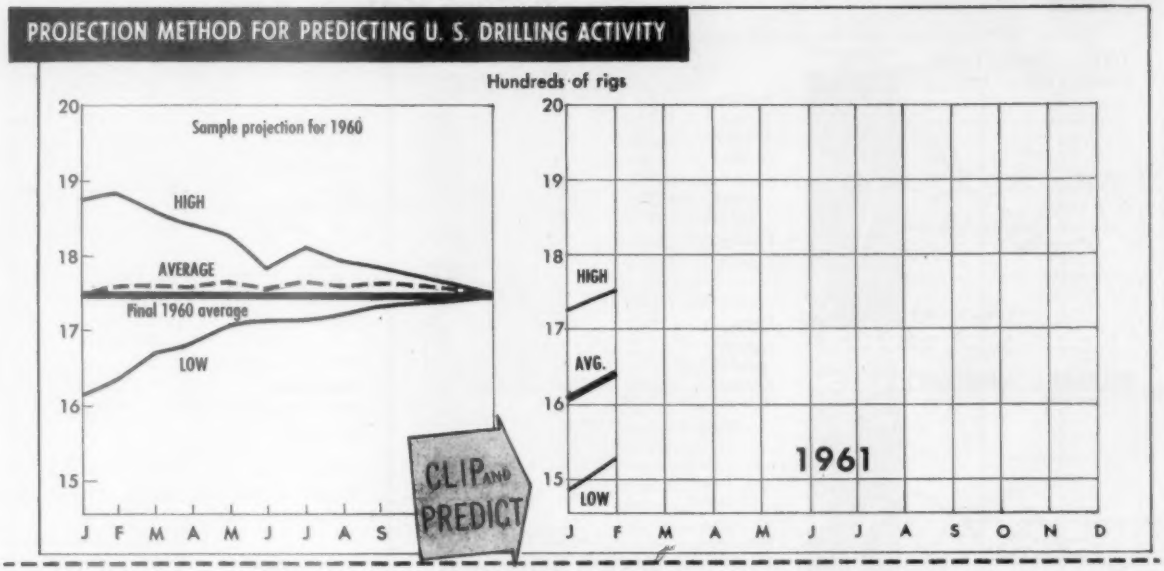


Make your own projection of rig activity

BY JOHN C. CASPER

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,188,590	UP	41,390	DOWN	76,233
Crude stocks	230,554,000	DOWN	1,677,000	DOWN	21,062,000
Completions	839	DOWN	30	UP	21
Refinery runs	8,376,000	DOWN	71,000	UP	268,000
Gasoline stocks	221,098,000	UP	3,095,000	UP	5,475,000
Kerosine stocks	23,805,000	DOWN	139,000	UP	1,927,000
Distillate stocks	96,716,000	DOWN	613,000	DOWN	12,099,000
Residual stocks	43,147,000	UP	370,000	DOWN	2,152,000
Four-product stocks	384,766,000	UP	2,713,000	DOWN	6,849,000
Total imports	2,221,900	UP	214,300	UP	354,400

ROTARY DRILLING tends to fall into a pattern by the end of the second quarter each year. If we can develop a relationship between the cumulative average through the end of a given month and the final average for the year, it will give an early clue to rig activity for the year.

The table at the bottom of this page shows average of rigs reported up to the end of each month, expressed as per cent of the average for the year. For example, rotary rigs for the January-March period of 1956 averaged 2,583. The average for the year was 2,619. The ratio of January-March to average for year was 98.63%, third column and third row in table.

For the 1954-59 period, the average number of rigs operating to the end of each month was divided by the over-all average of rigs reported for the year to give the figures in the table. The high ratios are marked by (•). The low years are marked by (★).

The left-hand graph above shows month-to-month projections of rig activity for 1960. Average number of rigs to end of each month was divided by the "high" and "low" ratios from the table to give high and low ranges of projection for the year. These points and the midpoint between these points were plotted each month.

For example, take September. The January-September average for rotary rigs last year was 1,733. The average divided by the high September ratio from the table (100.04) gives 1,732. If it is divided by the low ratio (96.68), the plot point is 1,793. The midpoint between these two extremes is 1,763. Find these September points on the cures for 1960.

Follow this same procedure for completing the curves for 1961. For your convenience we are adding a line at the bottom of the Active Rotary Rig table (page 208) showing cumulative average to date.

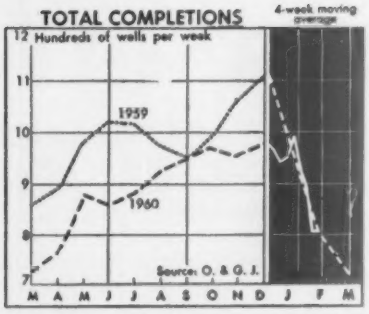
At the end of each month, divide this cumulative average by the high and low ratios for that month as shown in the table. Plot the results, along with the midpoint between the two numbers, on the unfinished graph.

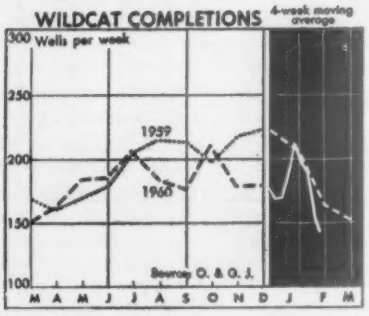
This year's pattern should begin to develop by the end of April or May. We plan to bring this 1961 chart up to date, but you may be able to pick the trend earlier.

RIGS TO END OF EACH MONTH
(Cumulative average expressed as per cent of year's average)

	1954	1955	1956	1957	1958	1959
Jan. (only)	99.32	★90.21	99.16	96.37	•104.67	90.82
Jan.-Feb.	99.68	90.81	97.21	95.50	•102.54	★89.28
Jan.-Mar.	•100.36	92.15	98.63	96.99	98.96	★90.39
Jan.-Apr.	•101.44	93.56	99.62	97.40	97.64	★92.81
Jan.-May	•101.39	★94.75	100.46	97.24	96.78	94.98
Jan.-June	•101.40	★95.91	101.26	97.98	96.42	97.20
Jan.-July	101.04	96.50	•101.11	98.85	★96.00	98.46
Jan.-Aug.	100.36	97.13	•100.50	99.55	★96.37	99.03
Jan.-Sept.	99.64	97.73	•100.04	99.92	★96.68	99.42
Jan.-Oct.	99.16	98.25	99.77	•99.83	★97.30	99.52
Jan.-Nov.	99.32	98.99	99.66	99.71	★98.39	•99.90
Jan.-Dec.	100.00	100.00	100.00	100.00	100.00	100.00

★ Low year. • High year.





Active Rotary Rigs

	2-27-61	2-20-61	2-29-60
Alabama	4	5	4
Alaska	7	7	(*)
Arkansas	12	15	17
Arizona	1	1	1
California	66	70	80
Land	63	66	75
Offshore	3	4	5
Colorado	25	19	22
Florida	2	2	1
Land	1	1	0
Offshore	1	1	1
Georgia	1	0	0
Illinois	15	19	21
Indiana	4	2	4
Kansas	108	107	91
Kentucky	1	4	5
Louisiana	269	274	282
North	23	25	25
S. Inland waters	110	104	125
S. Land	80	87	85
Offshore	56	58	47
Michigan	21	21	37
Mississippi	50	46	69
Missouri	1	1	1
Montana	17	18	12
Nebraska	20	21	23
Nevada	1	1	0
New Mexico	87	91	94
North Dakota	14	14	8

	2-27-61	2-20-61	2-29-60
Ohio	6	6	3
Oklahoma	168	176	196
Oregon	0	1	0
Pennsylvania	5	6	8
Texas	537	543	595
S. Inland waters	7	6	8
S. Land	136	146	167
Offshore	2	2	0
North	47	44	38
Panhandle	52	49	45
East	43	40	48
West Central	‡135	‡148	194
West	115	108	95
Utah	27	32	28
Washington	1	1	0
West Virginia	5	6	4
Wyoming	54	44	54
Total U. S.	1,529	1,553	1,660
Western Canada	187	197	248
Eastern Canada	1	0	4
Grand total	1,717	1,750	1,912

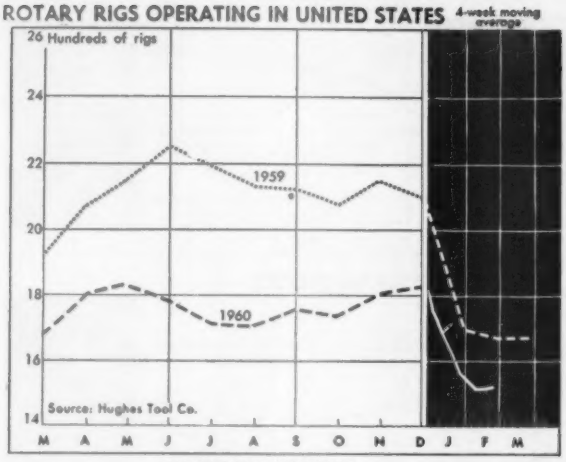
Hughes Tool Co. report. *Data first reported 4-4-60. ‡Stephens and Eastland counties now included in West Central.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED FEBRUARY 25, 1961

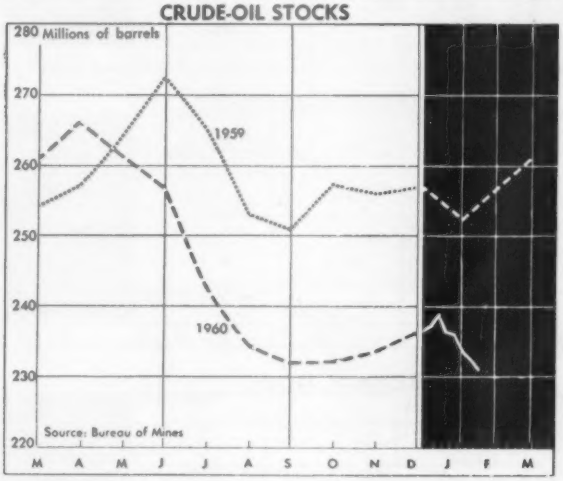
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1961	1960	Total	Crude	Cond.	Gas	Dry	1961	1960
Arkansas	19	11	0	0	0	8	67,601	82	108	1	0	0	0	1	21	29
California	19	11	0	3	4	1	70,243	279	209	3	0	0	1	2	38	50
Colorado	9	2	0	1	6	0	56,075	103	119	4	0	0	1	3	60	60
Illinois	53	14	0	0	19	20	92,105	335	436	12	1	0	0	11	67	111
Indiana	11	2	0	1	8	0	12,690	116	158	5	0	0	0	5	24	60
Kansas	139	59	1	3	56	20	321,119	855	574	19	2	0	1	16	163	179
Kentucky	12	3	0	3	6	0	23,265	181	354	1	0	0	0	1	18	44
Louisiana	43	17	0	8	18	0	238,904	555	537	4	0	0	0	4	74	72
North	27	11	0	7	9	0	83,704	210	178	2	0	0	0	2	29	30
South	12	3	0	1	8	0	112,122	270	273	2	0	0	0	2	42	37
Offshore	4	3	0	0	1	0	43,078	75	86	0	0	0	0	0	3	5
Michigan	13	2	0	2	9	0	42,059	126	121	4	0	0	0	4	55	41
Mississippi	2	2	0	0	0	0	22,232	99	123	0	0	0	0	0	37	47
Montana	7	2	0	0	5	0	35,168	65	44	4	0	0	0	4	31	22
Nebraska	8	2	0	0	6	0	34,050	106	117	5	0	0	0	5	50	46
New Mexico	25	16	0	5	4	0	131,480	269	328	6	4	0	0	2	44	43
West	8	3	0	5	0	0	35,593	112	111	0	0	0	0	0	14	9
East	17	13	0	0	4	0	95,887	157	217	6	4	0	0	2	30	34
New York	0	0	0	0	0	0	0	119	72	0	0	0	0	0	2	5
North Dakota	3	2	0	0	1	0	20,159	34	51	0	0	0	0	0	6	8
Ohio	37	26	0	6	4	1	86,530	171	209	0	0	0	0	0	7	12
Oklahoma	158	72	1	16	50	19	532,872	907	634	17	3	0	2	12	108	123
Pennsylvania	0	0	0	0	0	0	0	102	67	0	0	0	0	0	7	5
Texas	223	123	4	12	72	12	997,371	2,269	2,661	38	6	0	0	32	472	557
Dist. 1	8	2	0	0	6	0	19,919	131	194	5	0	0	0	5	47	75
Dist. 2	12	3	0	1	8	0	93,613	115	113	4	0	0	0	4	26	29
Dist. 3	17	4	1	1	11	0	133,600	172	219	5	0	0	0	5	46	44
Dist. 4	12	6	0	1	4	1	53,537	209	222	0	0	0	0	0	49	63
East	7	4	0	0	3	0	38,474	175	211	1	0	0	0	1	40	45
Dist. 7-B	34	21	0	0	10	3	89,426	316	364	6	2	0	0	4	85	104
West	78	52	3	0	18	5	407,157	561	705	13	3	0	0	10	113	114
Dist. 9	33	20	0	0	11	2	65,485	379	460	3	1	0	0	2	49	71
Dist. 10	22	11	0	9	1	1	96,160	211	173	1	0	0	0	1	17	12
Utah	9	6	0	1	1	1	53,492	34	43	1	0	0	0	1	20	16
West Virginia	26	2	0	21	3	0	57,762	168	141	0	0	0	0	0	0	1
Wyoming	17	6	1	4	4	2	90,071	166	163	4	0	1	0	3	70	66
Miscellaneous*	6	4	0	0	2	0	50,468	61	26	2	0	0	0	2	46	14
Total U. S.	839	384	7	86	278	84	3,035,716	7,202	7,295	130	16	1	5	108	1,420	1,611
Total prev. week	869	418	10	115	276	50	3,448,936	.....	.....	151	19	0	12	120	.....	.....
Cum. 1961	7,202	3,272	181	691	2,594	464	29,076,586	.....	.....	1,420	121	20	59	1,220	.....	.....
Cum. 1960	7,295	3,383	232	656	2,781	243	31,388,281	.....	.....	1,611	152	15	52	1,392	.....	.....
Western Canada	35	14	0	5	14	2	178,310	379	353	10	0	0	2	8	115	96

*Alabama, Missouri, Arizona.

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	2-18-61	2-11-61	2-20-60
Pennsylvania	2,113	2,109	2,311
Other Appalachian	1,211	1,294	1,883
Illinois, Indiana, Michigan	8,511	8,901	9,525
Nebraska and North Daktoa	2,969	2,912	2,710
Kansas	9,256	9,152	9,437
Oklahoma	15,689	15,292	16,870
Arkansas	1,557	1,652	2,075
Louisiana	17,701	17,796	18,782
North	3,228	3,143	2,885
South	14,473	14,653	15,897
Mississippi, Alabama, Florida	1,806	1,754	2,667
New Mexico	7,067	7,153	7,565
Texas	97,411	97,627	106,841
East Texas	8,147	7,936	7,724
West Texas	44,775	44,887	50,255
Texas Gulf	16,404	16,667	18,742
Other Texas	28,085	28,137	30,120
Wyoming	16,756	17,011	17,589
Other Rocky Mountain	10,054	9,838	9,047
California	24,953	25,248	29,053
Foreign	†13,500	14,492	15,261
Total	**230,554**	232,231	251,616

*Bureau of Mines. †Includes 4,100,000 bbl. in California.

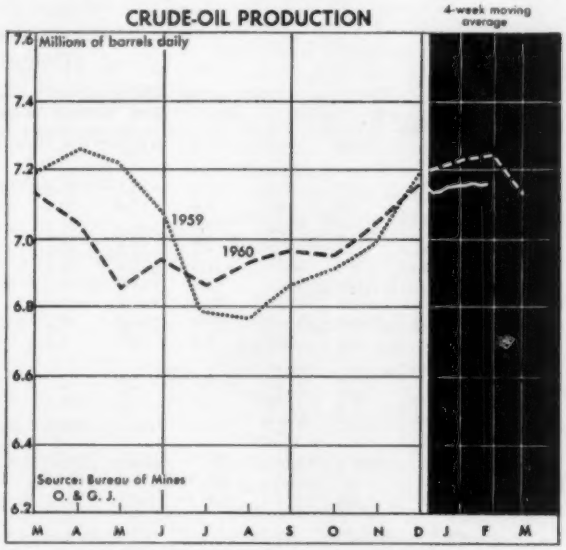
DAILY AVERAGE PRODUCTION FOR WEEK

	February 25, 1961			Feb. 18
	Crude oil	Lease condensate	Total	total
Alabama	21,050	.....	21,050	21,000
Alaska	8,200	.....	8,200	7,500
Arkansas	78,175	150	78,325	78,300
California	824,000	.....	824,000	825,000
Colorado	131,600	.....	131,600	132,000
Eastern	38,400	.....	38,400	35,600
Florida	1,000	.....	1,000	1,000
Illinois	213,500	.....	213,500	212,200
Indiana	32,200	.....	32,200	31,700
Kansas	†314,515	.....	†314,515	†308,000
Kentucky	56,300	.....	56,300	56,300
Louisiana	990,650	147,450	1,138,100	1,138,050
North	105,650	6,200	111,850	111,800
South	885,000	141,250	1,026,250	1,026,250
Michigan	49,500	.....	49,500	49,600
Mississippi	146,700	4,250	150,950	150,950
Montana	81,700	.....	81,700	81,200
Nebraska	66,400	.....	66,400	66,100
Nevada	50	.....	50	50
New Mexico	291,500	8,500	300,000	300,000
North Dakota	71,000	.....	71,000	68,900
Oklahoma	†529,750	.....	†529,750	†503,100
Texas	2,500,000	100,350	2,600,350	2,600,350
Dist. 1	42,000	3,700	45,700	45,700
Dist. 2	104,000	8,400	112,400	112,400
Dist. 3	317,000	41,000	358,000	358,000
Dist. 4	177,000	15,000	192,000	192,000
Dist. 5	27,000	500	27,500	27,500
Dist. 6	113,000	8,500	121,500	121,500
East Texas field	132,000	.....	132,000	132,000
Dist. 7-B	128,000	400	128,400	128,400
Dist. 7-C	113,000	4,050	117,050	117,050
Dist. 8	1,057,000	13,000	1,070,000	1,070,000
Dist. 9	189,000	3,800	192,800	192,800
Dist. 10	101,000	2,000	103,000	103,000
Utah	97,000	.....	97,000	96,000
Wyoming	384,000	.....	384,000	383,600
Others	‡700	.....	‡700	‡700
Total U. S.	6,927,890	260,700	**7,188,590**	7,147,200
Change from prev. week, up			**41,390**	.....
Canada	†612,700	.....	†612,700	†573,800

Total U. S. production—Jan. 1-Feb. 25 ..... 401,120,100 bbl.
Same period last year (crude plus cond.) ..... *405,282,700 bbl.

*Includes 12,625,400 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Arizona.

CRUDE-OIL PRODUCTION



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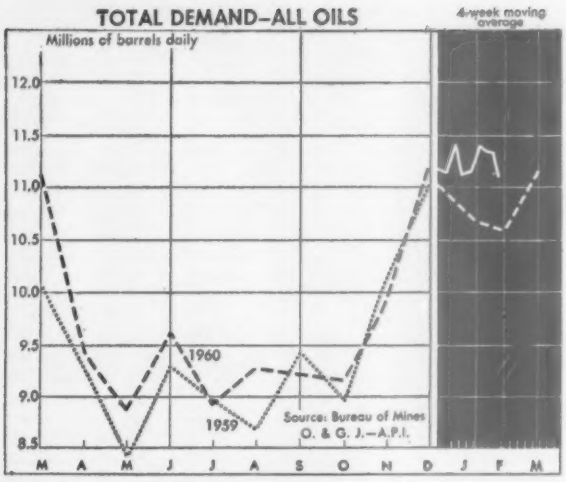
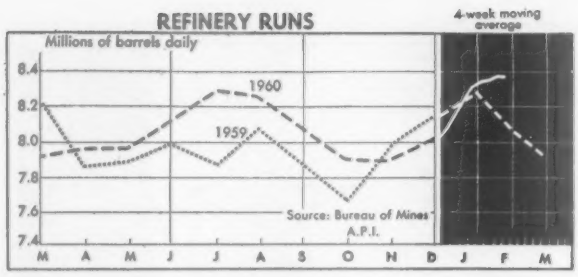
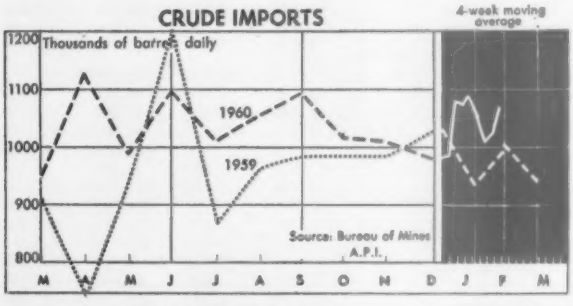
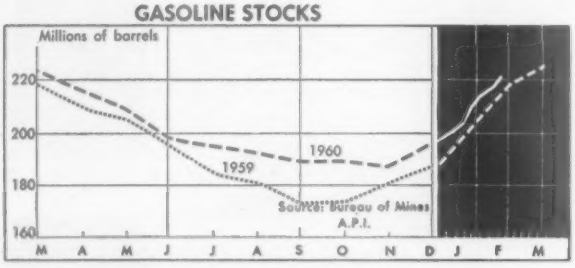
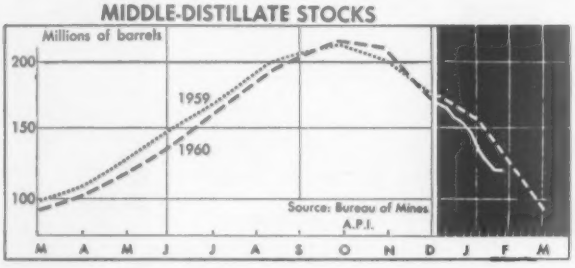
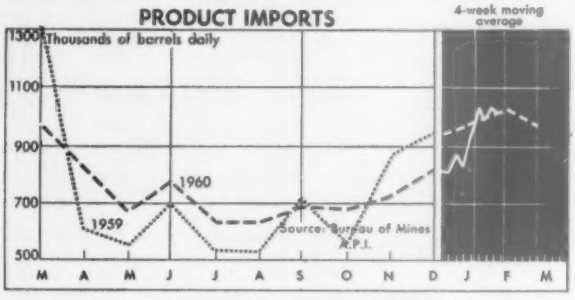


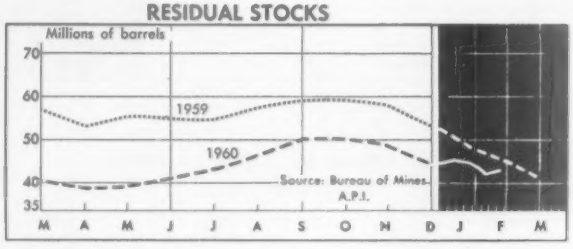












API REFINERY REPORT—FEBRUARY 24, 1961

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, February 1960 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,186	543.7	41.6	421.1	159.3	47,329	9,573	31,408	12,640	1,117	538.3	33.8	321.0	173.1
Appalachian:														
Dist. 1	99	40.9	4.4	22.7	15.0	6,058	628	2,457	525	98	40.9	3.7	21.1	14.9
Dist. 2	89	48.3	6.9	17.0	13.4	3,223	315	972	324	106	54.8	7.4	18.3	15.4
Ind., Ill., Ky.	1,552	790.4	72.6	368.3	191.2	38,171	4,443	16,445	5,337	1,489	769.2	68.5	314.0	206.7
Minn., Wis., Dak.	129	62.6	4.7	25.1	18.6	6,855	706	5,053	616	117	54.2	4.9	26.8	19.0
Okla., Kans., Mo.	750	402.8	18.3	196.3	20.9	21,167	1,009	8,843	798	741	410.2	15.1	186.6	31.3
Inland Texas	284	215.9	13.3	45.3	18.3	8,419	483	1,280	2,459	292	205.3	10.1	44.4	22.6
Texas Gulf Coast	2,044	951.7	110.3	653.2	162.0	33,327	2,534	8,083	5,323	1,902	956.2	120.4	453.1	140.4
La. Gulf Coast	687	334.0	75.7	195.4	47.4	12,502	1,475	3,741	1,408	663	333.0	63.1	130.3	50.0
N. La. and Ark.	110	66.7	4.0	23.1	7.1	5,945	474	2,148	136	109	66.7	7.6	22.3	6.9
Rocky Mountain:														
New Mexico	23	11.7	0.7	5.9	2.3	911	51	131	64	25	13.1	0.4	4.0	2.3
Other Rocky Mt.	271	127.0	5.1	67.6	35.1	7,636	394	2,228	1,015	302	141.4	4.4	70.4	35.3
West Coast	1,152	517.7	37.3	205.4	298.3	29,555	1,720	13,927	12,502	1,104	535.8	19.5	176.6	280.0
Feb. 24, 1961	8,376	4,113.4	394.9	2,246.4	988.9	221,098	23,805	96,716	43,147	8,065	4,119.1	358.9	1,788.9	997.9
Feb. 17, 1961	8,447	4,098.4	416.7	2,276.4	881.4	218,003	23,944	97,329	42,777	.....	.....	.....	.....	.....
Feb. 26, 1960	8,108	4,094.7	290.3	1,884.0	997.1	215,623	21,878	108,815	45,299	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (Inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Jules-burg	Wyo. (sour)
14-14.9	$1.86	....	....	....	....	....	....	....	....
15-15.9	1.93	....	....	....	....	....	....	....	1.81
16-16.9	2.00	....	....	....	....	....	....	....	1.86
17-17.9	2.06	....	....	....	....	....	....	....	1.96
18-18.9	2.13	....	....	....	....	....	....	....	1.96
19-19.9	2.20	....	....	....	....	....	....	....	2.01
20-20.9	2.27	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague.

Flat Prices

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.23-3.53
Van	3.08
Pennsylvania Grade:	
Bradford	$4.75-4.80
Middle District	4.52
Southwest Pennsylvania	4.25
West Virginia	4.17
Buckeye Grade	4.08
Illinois Basin	3.00-3.05

Foreign

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)	
Arabian, 34.0°-34.9°, Ras Tanura	$1.80
Iranian, 34.0°-34.9°, Bandar Mashur	1.78
Iranian, 34.0°-34.9°, Abadan	1.73
Iraq, 35.0°-35.9°, Fao	1.72
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.59
Qatar, 41.0°-41.9°, Umm Said	1.95
Middle East, E. Mediterranean:	
Arabian, 34.0°-34.9°, Sidon	$2.17
Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli	2.19
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 36°	2.42
Canada:	
Leduc-Woodbend	$2.53
Redwater (Alta.)	2.42
Weyburn (light)	2.06
Midale C	1.70
Venezuela:	
Cumbarebo, 47°-47.9°, Tucupido	3.34
San Joaquin, 40°-40.9°, Puerto La Cruz	3.08
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

★ Gulf-NY, clean (ATRS+35%)	$3.85
★ Gulf-NY, dirty (ATRS+37.5%)	3.92
★ Carib.-NY, dirty (ATRS−60%)	1.08
★ Carib.-UK, clean (Scale−57.5%) (13s. 10d.)	1.94
★ PG-UK, dirty (Scale−50%) (30s. 2d.)	4.23

★Denotes change previous week.

Refined-Product Prices

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

Gasoline*

Mid-Continent (Group 3):	
Regular (91 octane)	12.00-12.25
Premium (99 octane)	14.75-15.00
Natural gasoline (26-70)	4.5
Breckenridge	4.0
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	11.00
Regular (92 octane)	11.25
Premium (98 octane)	12.25
California (rack) Los Angeles:	
Regular (90 octane)	11.30
Premium (95 octane)	12.30
Premium (100 octane)	13.80
Caribbean area (cargoes):	
Regular (87 octane)	9.50
Premium (97 octane)	11.625

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

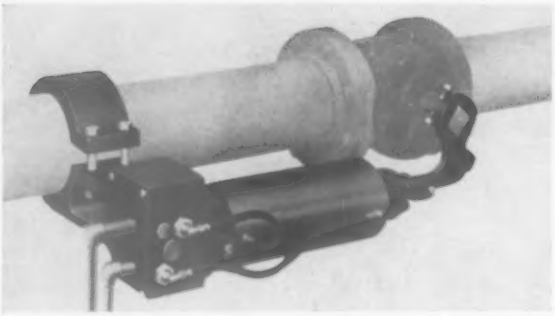
Kerosine and Distillate

Mid-Continent (Group 3):	
Kerosine 42-44	10.625-10.75
Diesel oil (58 d.i. and above)	10.25
Distillate No. 1	10.25
Distillate No. 2	9.25
Gulf Coast (cargoes):	
Kerosine 41-43	10.25
Distillate No. 2	9.50
New York Harbor (barges):	
Kerosine 42-43	11.90
Distillate No. 2	10.90
Diesel fuel, 48-52 d.i.	11.05
Caribbean area (cargoes):	
Distillate No. 2	8.625

Residual Fuel (Bbl.)

Mid-Continent (Group 3):	
Residual fuel (max 1% S)	$1.90
Gulf Coast (cargoes):	
Bunker C fuel	2.30
New York Harbor (barges):	
Bunker C fuel	2.52
Caribbean (cargoes):	
★ Bunker C	2.00
California (rack):	
Bunker C fuel, Los Angeles	2.25

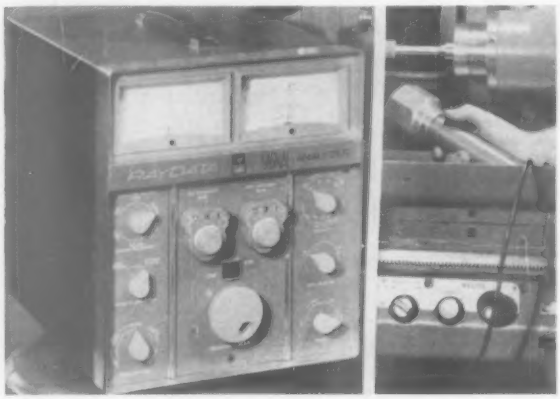
Plug, butterfly valve



. . . for valve sizes up to 12 in. can be powered by plant air, bottled dry gas, natural gas, hydraulic fluid, or water. According to the maker, it is not necessary to remove the valve from service to attach the Pantex valve actuator.

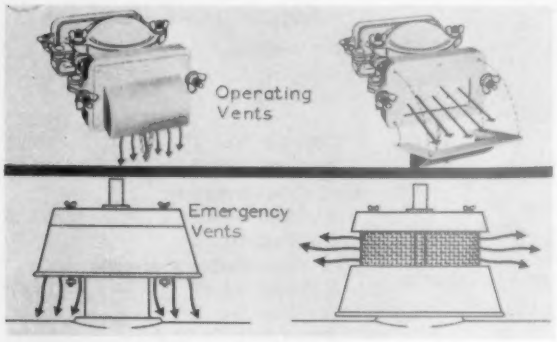
The complete assembly includes: (1) lever arm, (2) cylinder, (3) pipe mounting bracket, (4) control-valve housing, and (5) connecting hoses. The actuator can be operated by remote control with a solenoid control valve mounted in the bracket housing. Source: **Pantex Valve Actuators, P. O. Box 22351, Houston 27, Tex., U.S.A.**

New vibration analyzer



. . . and portable balancer offers a way to study and analyze vibration sources in machinery, buildings, and pipelines. The Model 41 analyzer can be operated from an internal battery or on conventional 110-volt a.c. power. A variety of plug-in input adapters permit use of most types of transducers.

A wide range of measurement is possible as voltage input can be manually varied from 50 mv. to 100 volts. This permits an amplitude range from 5 microinches to 100 millinches, peak to peak; a frequency range from 3 to 10,000 c.p.s., and from 180 to 100,000 c.p.m.; and a velocity range from 50 microinches to 100 in. per second. The accuracy of these ranges is 2%. Source: **RayData Corp., 1078 E. Granville Rd., Columbus 24, Ohio, U.S.A.**



Operating, emergency vents

. . . recently put on the market are designed to insure a horizontal discharge of ignited flammable liquid vapors and to prevent localized flame impingement on the tank structure. The units have weatherproof hoods that fuse and fall free of the vent outlet if escaping vapors are ignited.

Under normal, no-fire conditions, the weather hoods protect tank contents against rain, snow, and airborne contaminants. The aluminum hoods are secured to the vent body with a heat-sensitive alloy that fuses at a predetermined temperature and so permits the hood to drop free of the vent.

As this occurs, the discharge immediately becomes horizontal, preventing further impingement of fire on the tank. A chain connects the weather hood to the valve body to prevent loss of the hood. Source: **Protectoseal Co., 1920 S. Western Ave., Chicago 8, Ill., U.S.A.**

Reinforced insulated bushings

. . . of glass-fiber-reinforced nylon are on the market for use in cathodic protection in sizes from ½ to 2 in.

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DOWSING—Oil, 43 years. Practical experience drilling and production. Expenses and small fee from production. C. A. Stone, 3843 W. Slauson, Los Angeles, Cal., AX 2-2559.

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LEASE AND DRILLING BLOCKS

5,000 ACRE RECTANGLE N.E. Kentucky. Within brown area, Page 54, May 30, 1960, The Oil and Gas Journal. Box 446, Charleston 22, W. Virginia.

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OIL LEASE CRANE County, Texas: Available S/239 acres, Section 18, Block B-23, PSL, two miles from new gas discovery Section 23, Blk. 4, H&TC, Hill & Meeker well. Quick action, address landowner: Jefferson G. Smith, 715 Littlefield Building, Austin 18, Texas.

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LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. This has reference to offer of lands for oil and gas leasing published in this journal on January 16 and 23, 1961. The offer is hereby withdrawn, since it is held that the rental or minimum royalty rate provided in the offer is not authorized. A new offering of the lands will be announced in the near future. Arvin H. Olswold, Chief, Minerals Section.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that approximately 30 acres of land in one parcel within the known geologic structure of a producing oil and gas field, undefined, in Allegan County, Michigan, will be offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 1:00 P.M., E.S.T. March 29, 1961, when bids will be opened. Full details of the lease offering, and how and where to submit bids, may be obtained from the Manager, Eastern States Land Office, Bureau of Land Management, Washington 25, D.C. H.K. Scholl, Manager.

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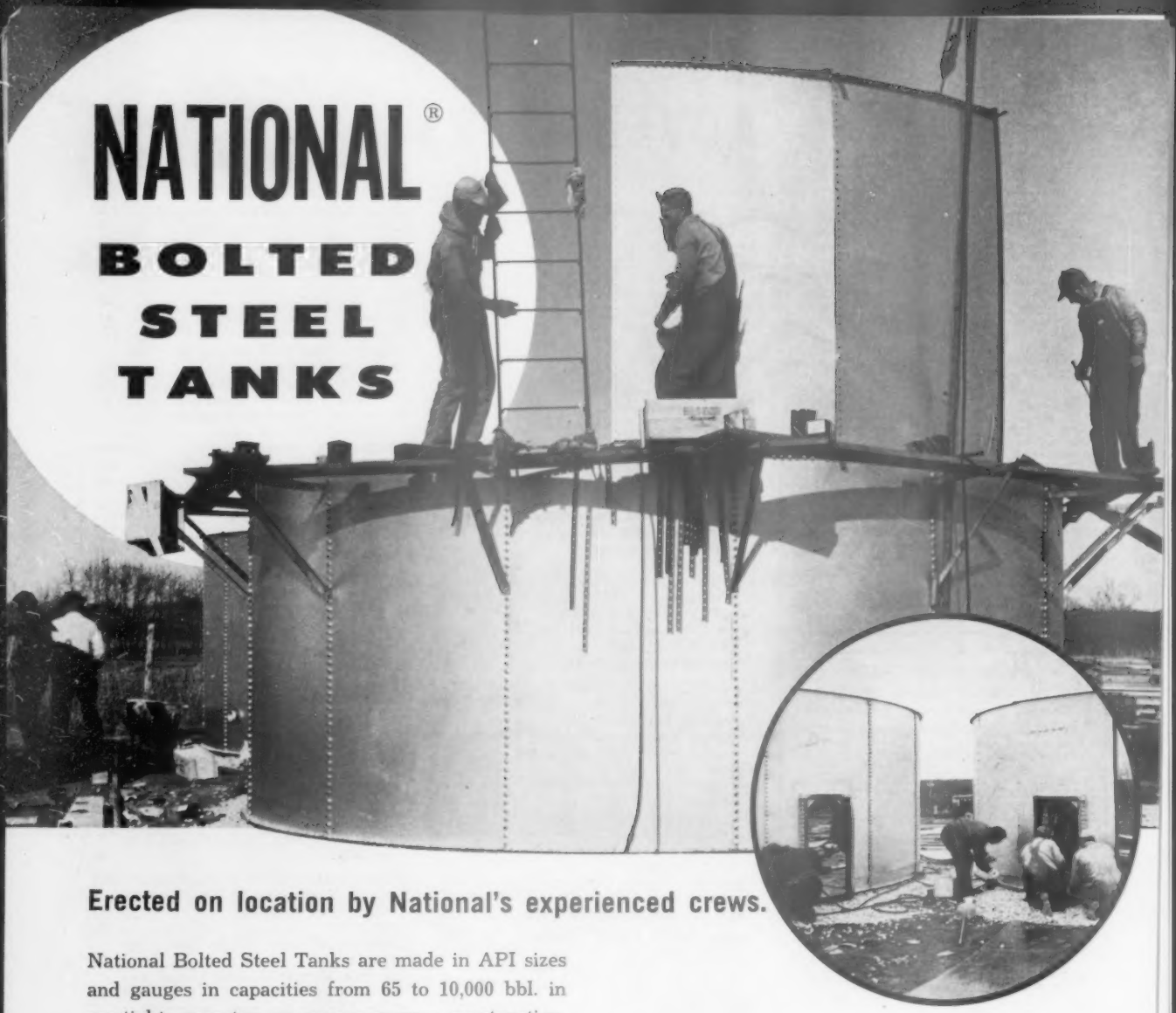
NATIONAL®

BOLTED STEEL TANKS



Erected on location by National's experienced crews.

National Bolted Steel Tanks are made in API sizes and gauges in capacities from 65 to 10,000 bbl. in gas-tight, open-top or vapor-pressure construction. All gasketing between staves and at bolt holes is neoprene.

National Bolted Steel Tanks are designed to be quickly and easily erected, dismantled, shipped to a new location and re-erected.

National Bolted Steel Tanks can easily be changed in diameter or height, and adapted to the storage of cement, fertilizer, chemicals, oil, water and any other liquid or granular material.

National painted tanks offer the most in low cost storage.

Galvanized-after-fabrication Tanks, a National First, offer the highest corrosion resistance to sour oils and salt water and air deterioration.

A PLUS VALUE WITH ALL NATIONAL PRODUCTS . . . Engineers and field crews living in your area in the U. S. and Canada with 55 stocked warehouses to size, install and service your National Bolted Steel Tanks.

It's a National®

NATIONAL TANK COMPANY

DRAWER 1710

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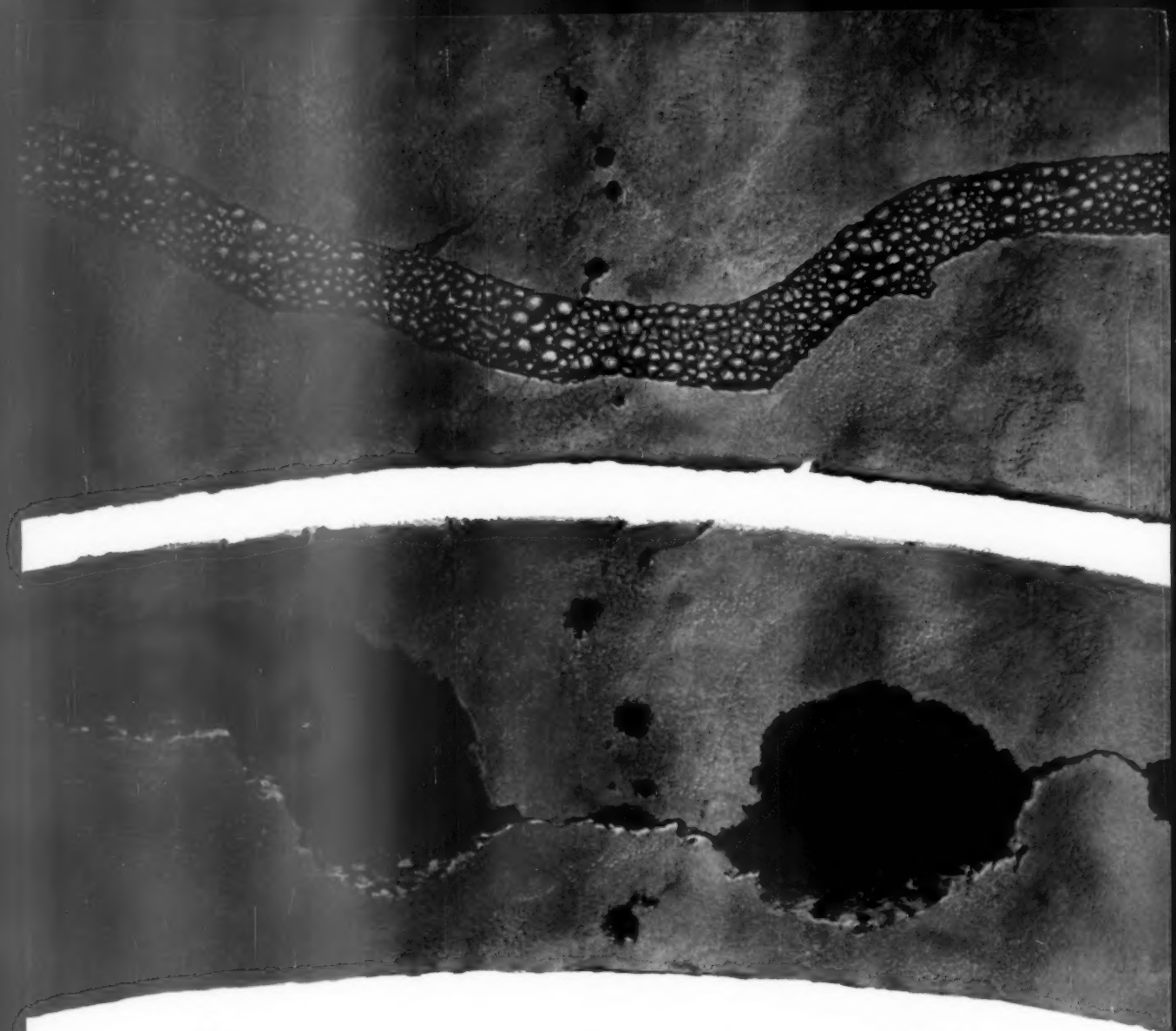


Which treatment makes the better well ?

These inside-the-well-bore views of enlarged sections of treated formation, as visualized by an engineer, compare two methods of stimulation.

The top illustration represents a sand-packed fracture after conventional fracturing. This type of treatment often gives good production increases at low cost. Many wells, however, do not respond profitably to these treatments. Small production increases, rapid production declines, or trouble with sand returns may limit profits.

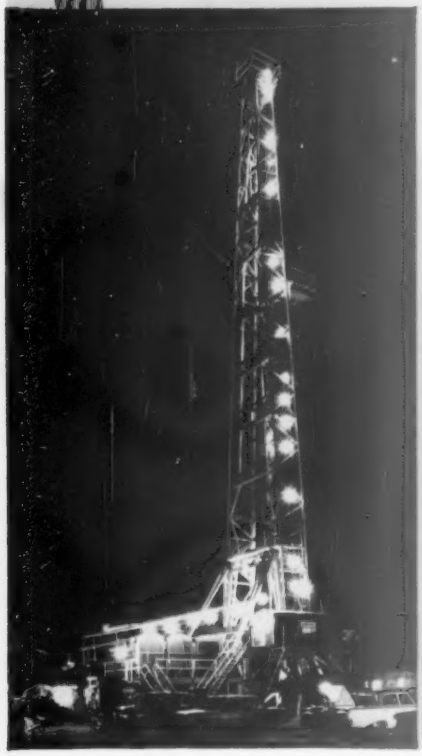
The bottom illustration depicts the probable result of a new type of Dowell treatment. It uses slow-reacting Retarded Acid injected at a high rate to create open flow channels over a large drainage area. Since the etched formation supports itself, there is no need for using sand that might crush, imbed, or flow back with production. This new treatment technique is giving excellent production increases in many areas.

Which treatment is better for you? Your Dowell representative can help you decide when he knows the facts about *your* well, *your* production requirements and *your* profit objectives. Check with him now! Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela, Argentina, Germany, France and the Sahara area. Dowell, Tulsa 1, Oklahoma.

SERVICES FOR THE OIL INDUSTRY **DOWELL** DIVISION OF THE DOW CHEMICAL COMPANY

THEY PLANNED ON YELLOW STRAND "POWERSTEEL" TO HOLD DOWN COSTS

with a
Yellow Strand "Tailored"
cut-off program



Arrow's Rig 22, near Petal, Mississippi

Arrow Drilling Co. Reports an Average of 25% Longer Service Life with "POWERSTEEL"!

"POWERSTEEL" rotary drilling lines are paying off for Arrow Drilling in rigs all over the country–paying off in longer life, greater strength and less servicing. Even bad rock formations that caused bit "chatter" at one rig location failed to cut the full service life of "POWERSTEEL". Broderick and Bascom's "Tailored" cut-off plan was important, too, in increased service life. Discover yourself how the combination of "POWERSTEEL" and the B & B "Tailored" cut-off plan can lower your costs. Your Yellow Strand Distributor or representative will be glad to assist you. Call on them for service, anytime.

Yellow Strand®
"POWERSTEEL"

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